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[OFFICIAL CIRCULAR.]

ANNUAL MEETING WESTERN GAS ASSOCIATION.

SECRETARY'S OFFICE WESTERN GAS ASSOCIATION, QUINCY, ILLS., April 28, 1885.

This notification will be the last formal statement or appeal that can be made by your Secretary through the columns of the JOURNAL with respect to the Eighth Annual Meeting of the Western Gas Association, and therefore would I once more urge upon your attention the importance and value of united effort and concerted action, so that when the hour of final adjournment arrives we can all congratulate ourselves that the '85 session had been productive of even greater good to the fraternity than that which has resulted as a consequence of our former deliberations. With perfect sincerity I may put forward the claim that our Eighth Annual Meeting will be an entirely successful and harmonious gathering. Every present and presumptive evidence tends to prove the pleasant prediction advanced; but, keeping in view the fact that success admits of no restrictive limit, it is well to bear in mind that as the greater is our success the larger will be the margin afforded for future congratulation.

Let every member, then, make the journey to Chicago, Ills., primed with the consciousness that he is going to be a factor in the proceedings, and determined that he shall contribute his due share to the value thereof. The Committee of Arrangements have made every preparation for the personal comfort of those who shall visit the Tremont House on the 13th, 14th, and 15th days of May; and your Secretary would once more request that intending participators in the Eighth Annual sessions apply to Committee, in advance, for rooms, etc. As explained in previous notices, special rates have been made for the occasion by the Tremont House proprietors; the prices for guests ranging upward from the figure of $2.50 per day. Size and locations of apartments determine the scale of cost. Prudent men, to say nothing of wary travelers, whenever possible, make provision for such things as creature comforts in advance. And since "a hint to the wise is sufficient," enough has been said on the score just discussed.

I know that I but give expression to the united voice of the members of our Western Gas Association when I say that one of the most thoroughly enjoyable features of the St Louis meeting of 1884 was the presence of the Eastern brethren who honored us with their attendance. We want them again, and most heartily do we extend a cordial invitation to them to repeat the visit of a year ago. This invitation is meant to embrace the fraternity of all kindred gas associations; and those who will accept of our summons to hospitality will find the latchstring in its proper place.

I am enabled to present the following list of papers to be read at the coming meeting:

The Steam Jet Exhauster and Naphthaline, by Mr. J. B. Howard.
Stoppages in Small Works, by Mr. V. L. Elbert.
Pressure of Gas in Street Mains, by G. A. Hyde, sr.
Gas Bills *versus* Gas Light, by B. E. Chollar.
The Proper Location of the Gas Meter, by J. G. Miller.
The Utilization of Waste Heat from the Benches, by J. W. Dunbar.
Cooper Coal Liming Process, by Geo. Shepard Page.

In addition to the above, essays on subjects, still untitled, have been promised by Prof. S. H. Douglass, Messrs, E. H. Jenkins, E. J. King, and E Lindsley, while still others may be expected.

Now, gentlemen, it is only fair to assume that by your presence you will testify to an appreciation of the labors of the members who will so generously contribute to your fund of information by their presentation of especially prepared papers on the subjects set forth. Let there be a general closing up of the ranks, and there can be only one result.

Yours sincerely, A. W. Littleton, Secretary.

OBITUARY—MR. GEORGE CORNELL.

The hand of death has once more pressed heavily upon the Western brotherhood, and the gas fraternity is called upon, all too speedily after the striking down of Mr. Butterworth, to lament the decease of Dr. Geo. Cornell, late Secretary and Treasurer of the Youngstown (Ohio) Gas Light Company, whose demise occurred, on the evening of Wednesday, April 22d, at his former home on East Rayen avenue, Youngstown. The Doctor had been for years a sufferer from marasmus, owing its origin to malarial poison introduced into his system while pursuing the duties of a surgeon to the army encamped before Vicksburg, Miss., during the now famous and memorable siege of that city in the late war of the rebellion.

The deceased was born on the 22d day of October, 1832, in the village of Rennselaerville, Albany county, N. Y., and was the youngest son of Mr. Gideon Cornell. He received a rudimentary education at the village academy, prosecuted his first studies in medicine at the office of the local physician, and afterwards at Cairo, N. Y., paying his way by teaching school through the winter season. He attended a series of lectures at the Castleton (Vt.) Medical College, finally graduating as a physician, from the medical department of the University of New York, in 1854. Four years thereafter Mr. Cornell visited Youngstown, and determined upon making that place his future home. Shortly after the breaking out of the war of the rebellion he went out with a company from the Western Reserve College. The company was ordered to go down the Ohio river as far as Vicksburg in charge of prisoners who were to be "exchanged;" and this duty accomplished, Mr. Cornell employed his medical skill and talent in alleviating the sufferings of disabled soldiers. It was at this period of service that he contracted a low malarial fever, the seeds of which finally undermined and destroyed what was naturally a robust health. Leaving Vicksburg, Mr. Cornell was appointed a surgeon in the United States volunteer service, later on being made contract surgeon at Camp Chase, Columbus, Ohio. When peace was restored he returned to Youngstown and devoted himself to the ordinary practice of his profession. In 1867 he was elected Secretary and Treasurer of the Youngstown Gas Company, which corporation had been organized by Mr. A. B. Cornell (brother of deceased) in 1866. In 1872 he married Miss Mary Bushnell. As issue of this marriage there were three sons and one daughter. Wife and children survive him.

The Youngstown Gas Light Company became a member of the Gas Light Association of the United States (now the American Association) at the first annual meeting held in New York city, Oct. 15th and 16th, 1873; and Mr. Cornell, who, like unto Mr. Butterworth, fully believed in the value of the annual meetings, was a member of that body in fact as well as in name. His last appearance at the sessions was made at New York city meeting of 1883. The Youngstown Company is also represented on the rolls of the Western Gas Association through the membership of Supt. Coombs, an evidence that Mr. Cornell thought that "what was good for the master was good for the man." Mr. Cornell was the real executive head of the Youngstown Company; and his thoroughly business-like policy, fairness and integrity obliged the citizens of his city to concede that even a gas man might be honest. His exemplary life gained for him the respect of his associates; and his kind, indulgent, winning nature ensured to him the confidence and affection of his family and friends. We are truly sorry to announce his demise; but we are pleased to record our testimony to his many shining qualities, so that the brightness of his memory may not be dimmed by the shadows of forgetfulness.

The funeral services were held in the First Presbyterian Church, Youngstown, at 10:30 o'clock, morning of Saturday, April 25th.

THE SIEMENS BURNER WINS AGAIN.

In these desert days of electric lighting schemes and schemers, when the ratepaying factors of our communities appear to be utterly lost sight of, or rather when not the slightest consideration is paid by the municipal authorities to the manner in which they are so recklessly plundering the people whose tax contributions are being constantly enlarged, by abnormal expenditure of public funds for the maintenance or prosecution of criminally extravagant experiments in public lighting, it becomes rather refreshing to behold an occasional oasis appearing on the arid sands of official prodigality. Before going on with the development of the oasis, it might be quite pertinent in connection with the above lines to mention a case in illustration of just how the New York taxpayers are suffering at the hands of the redoubtable worthies known in the Metropolis as the Gas Commission. On South street, taking the straight stretch of roadway commencing a trifle to the north of South Ferry and running thence northerly to the Fulton Ferry—in all a distance of certainly not over 1,000 yards, and in all likelihood much less—may be counted no less than 12 arc lights, each costing the city at the rate of $255.50, or a round sum of $3,066 for the twelvemonth. Now we do not pretend to claim that the spectacle afforded is not a brilliant one, but, on the contrary, freely admit it to be quite dazzling and picturesque. On one side of the roadway is the usual stretch of New York city store and office structures; on the other may be noted vessels of all shapes and sizes lying moored at their wharves. The positions of the arcs alternate—you encounter this one on the land side, the alternate lamp being located on the wharf. Undoubtedly the effect is both brilliant and spectacular; but what is its cost as compared with the lighting service really needed? To place 60 ordinary gas lamp posts at 16⅔ yards apart along that 1,000 yards of South street surface would cost, at the rate of $17.50 each, the annual sum of $1,050. The streetway, wharves, and bulkheads would be supplied with every requisite illumination need, and the taxpayers would be the gainers in the sum of just $2,016. About as bad a state of affairs prevails in other quarters of the city now exposed to the spluttering moons which, when not suffering from either partial or total eclipse, shed their ghostly pallor at the uniform rate of over one-quarter thousand dollars each per annum.

But to return to the Siemens Company. The success that attended the lighting of the Pension Building, Washington, D. C., on the occasion of the Cleveland inauguration ball was such that the supervising architect (the building is not yet completed) determined that the structure should not be permanently lighted by electricity, as was originally intended; but that high power Siemens Regenerative lamps be substituted therefor. The specifications for the gas fitting arrangements have been sent out to the bidders for plumbing work, and in these articles it is especially stipulated that the outlets are to be arranged so as to provide for the proper working of the Siemens burner lamps. An inspection of the plans develops the fact that it will take pretty nearly 300 burners to supply the requirements of the building. This really marks a new era in public lighting in this country, even although Boston, Mass., and Philadelphia, Pa., have already tried the experiment, to some extent, on the public thoroughfares. But the Washington case was only won, and the endorsement of the Supervising Architect secured, after practical test made in the building itself, and under most trying conditions—*i. e.*, at the Inauguration Ball of last March. That the Siemens Regenerative Gas Lamp Company is a busy firm we might note that the managers have been obliged to remove their offices from the factory, at 21st street and Washington avenue, to No. 721 Chestnut street, Philadelphia, Pa., the workshops remaining as before.

HOW THEY DO BUSINESS AT TROY, N. Y.

In the last issue of the Journal it was stated that the Troy (N. Y.) Council was inclined to light either a part or the whole of the streets with electricity. Bids were asked for 100 (more or less) arc lights, and the "Contracting Board" were somewhat astonished to find that proposals were also submitted by the Troy and Citizens Gas Light Companies. The figures handed in developed the following state of affairs:

Troy Electric Light Company,	45	cents	per light	per night.
Troy Gas Light Company,	39	"	"	"
Citizens " "	36	"	"	"

The Common Council threw out the lowest bid on the ground that the Citizens Gas Company was in default as to its franchise, because it had failed to "lay two pipes in each of the streets of the city." The Council then awarded the contract to the Troy Electric Company, at the price proposed by the Citizens Gas Company, and ordered the "Contracting Board" to draw up the agreement, the work of lighting to be commenced within ten days after the contract was signed. This plain statement carries its own interpretation; and we defy even the murkiest of other Council records to equal the Troy proceedings for plain, unvarnished rascality. We trust the Troy Electric Lighting Company will be called upon to furnish "more" than "less" in regard to the 100 lamps.

The Striking Miners Resume Work.

The striking coal miners in the Pennsylvania gas coal district, or in any event those engaged in the shafts of the Ocean Mine, are no longer to remain in their self-assumed position of "walking gentlemen." Mr. J. F. Hosack, Superintendent of Ocean Mine collieries, telegraphed the New York agents, morning of April 30th: "Miners go to work to-day." Work was resumed on the basis of 2½ cents per bushel—or agreeably to the terms proposed by Mr. Scott during last February. Later despatches convey the news that the Penn and Westmoreland miners have also agreed to the Companies' terms.

[Official Report—Continued from Page 203.]

Fifteenth Annual Meeting of the New England Association of Gas Engineers.

Held at Young's Hotel, Boston, Mass., Feb. 18 and 19, 1885.

Second Day—Morning Session—Feb. 19.

Continuation of Question-Box Discussion.

The President announced that the sixth question was,

"Will carbon deposit form as fast, or be as difficult of removal, with a degree of heat necessary for three-hour charges as under a heat requiring five hours to carbonize the same weight, other things being equal?"

The President—I do not know that many of the gentlemen present have run on three-hour charges. I think that Mr. Slater can give us some information in reply to the question.

Mr. Slater—I cannot claim we have discovered any special difference in that respect. If there is a difference it is too slight to be noticeable.

The President—Of course the heat at which your retorts are operated is higher than it would be if you were working with four or five-hour charges?

Mr. Slater—I think, were we running four or five-hour charges, the retorts would, at times, be hotter than if three-hour charges were being followed—*i. e.*, the variation would be greater. We maintain a more uniform heat in running three-hour charges with the Dieterich furnaces than we would in running four or five-hour charges with the old furnaces.

The President—According to my recollection, we made carbon pretty fast. Will Mr. Lamson give the result of our experiments with the Dieterich furnace?

Mr. Lamson—The deposit of carbon was very large; but the prime trouble was with the pitch. My own belief is that the deposit depends less on the high heats, and more on the pressures maintained in the retorts, and the space allowed (over the coal) for the gas to pass off. We all know that more carbon will form under high heats than would form under excessively low heats; but I believe, as said before, and speaking generally, that the deposit is owing chiefly to pressure conditions in retorts.

The President—We would like to hear from any gentleman who has tried three-hour charges; or from any one who has run five-hour charges.

Mr. Harbison—Mr. Slater says that he uses three-hour charges in operating the Dieterich furnace. Is that the usual custom with those who are using the Dieterich or the Stedman furnaces?

The President—Mr. Nettleton is using the Dieterich furnace; what does he say?

Mr. Nettleton—We run four-hour charges.

The President—You did use three-hour charges, did you not?

Mr. Nettleton—We did; but only for a very few days.

Mr. Slater—What is Col. Stedman's practice?

Mr. Stedman—We employ four-hour charges.

The President—So far as our own experience at Boston goes, I may say that we abandoned the use of three-hour charges, and have never run anything less than four-hour charges since. We ran three hours when we were first operating the Dieterich furnace, and were working then at a very high heat. Afterwards, even at a low heat, we found that we were much more liable to have stoppages from pitch in our standpipes with three-hour charges than we were when working off a greater quantity of coal in four-hour charges. This may have come from some local difficulty, possibly; but it was the fact that, even with comparatively low heats, we stopped our standpipes with pitch on three-hour charges, when the retorts which were right alongside of them, with four-hour charges, did not become stopped. We experienced no difficulty afterwards in running much higher heats and charging every four hours. As far as the deposit of carbon goes, I do not think it made much difference. With the furnaces which we have in operation to-day we have never run less than four-hour charges. Although Mr. Slater's experiments show what can be done under certain circumstances, I think that most people are opposed to the practice. I know that Mr. Forstall, of Chicago, Ills., has abandoned it, and so has Mr. McIlhenny, of Washington, D. C., although both of these gentlemen were assiduous in their efforts to make the thing a practical success. They found that it cost more to keep their standpipes and mains clean than was saved in labor.

Mr. Harbison—Will the distance of the standpipe from the face of the bench, or of the hydraulic main from the top of the brickwork, have anything to do with the deposit of carbon?

Mr. Stiness—Not a bit.

The President—Yet I have no doubt this nearness has much to do with pitch. I think that the closer the hydraulic main is to the bench the more trouble you will have from the accumulation of pitch in its bottom section. I am inclined to think flat mains are not very beneficial; and that it is a very good plan to have considerable quantity of water and less tar in bottom of hydraulic. That, at least, was the result of our experiments; and they led us to abandon the flat main which we had at one time put in.

Mr. Slater—I think that Mr. Sherman might give us the benefit of his experience with regard to position of the main.

Mr. Sherman—I will say, with respect to this matter, that all we did was to raise the main 20 inches over top of arch. We have had no trouble with pitch since; but before so doing, or when the main was only six inches from top of arch, we were very much annoyed with pitchy accumulation.

Mr. Harbison—What is the thickness of the brickwork on top of the arch?

Mr. Sherman—Twenty inches.

The President—And the hydraulic main was located three inches above that?

Mr. Sherman—No; we raised it 20 inches from top of bench.

The President—What was it before?

Mr. Sherman—Only two courses of bricks over firebrick arch.

The President—Is it not hot under your main now?

Mr. Sherman—No; and we do not have any more of the pitch that we had before the main was raised.

Mr. Harbison—You have 20 inches of air space between your brickwork and the top of the main?

Mr. Sherman—No; the air space is about six inches. There is 20 inches of brickwork which covers the whole stack.

Mr. Stiness—I think Mr. Greenough expresses my belief exactly when he says it is much better to have water than tar in the hydraulic main. I am now having built, and shall erect during the coming season, two sections of an inclined hydraulic main, from which, as I claim, all of the tar will be taken directly out, leaving nothing but water for the gas to encounter upon its entrance from the dip pipe. In the common flat main, with all the tar remaining therein, as it must, it so thickens and hardens as to make it almost impossible to pass the gas from the stand and dip pipes into the hydraulic. Under such a state of affairs the pressure thus caused upon the retorts produces the carbon which Mr. Lamson speaks about. I really believe this step of taking the tar away is a progressive move. Whether we have arrived at the full solution of the problem I am not ready to say; but I think that it is a movement in the nature of progress, and that it promises good success. I believe that in a year from to-day I shall be able to demonstrate to the members of the New England Association that my hydraulic main will be found to contain but a trifling tarry deposit, its other content being ammoniacal liquor. I believe that an inclined main can be made automatic in its action; or so that (as against the usual state of affairs now) its contents need not be drawn off once in 24 hours.

Mr. Lamson—I would like to ask Mr. Stiness what is the difference in level at the bottom.

Mr. Stiness—Four inches in a section of nine feet.

Mr. Lamson—In one bench?

Mr. Stiness—Yes; they are nine feet sections, four inches in each section; three sections in a stack, and inclined both ways. The stack of six benches will incline both ways to each end of the bench—standing the highest in the center.

Mr. Lamson—Then the stack is made of only two benches?

Mr. Stiness—No; I say it is a stack of six benches; and one portion (or of three benches) will incline in one way, and the other three benches will incline in the other direction. The difference in level will be fourteen inches.

Mr. Lamson—Then there will be fourteen more inches of liquid at one end than there is at the other?

Mr. Stiness—Yes.

Mr. Lamson—What depth of liquid is there at the shallow end?

Mr. Stiness—Seven inches of water at the shallow end—six inches of water and one inch seal. The level in the hydraulic main is the same. There is the same distance from the top of dip pipe to bottom of the hydraulic main seal that there is in any ordinary main. It is the bottom of the main which is made to incline. Each section inclines four inches, and two inches on the bonnet of the main.

The President—I suppose Mr. Sherman has very little deposit of carbon now, as a consequence of using valves instead of dip-seals?

Mr. Sherman—Nevertheless, I have more than I want.

The President—I was under the impression that those gentlemen who used valves on their dips did not have any carbon to speak of. I would like to ask those who have been using valves whether they have any carbon deposited.

Mr. Neal—I speak for the Charlestown Company; and we get a deposit of carbon in our retorts.

The President—How often is it necessary, and how long does it take, to burn out the retorts?

Mr. Neal—We use steam, which takes it out quite rapidly. We often allow our retorts to go five or six months without burning them out. Sometimes, though, we burn them out three times in the course of a year.

Mr. Sherman—I have to burn out every month. Mr. Edge, from whom I purchased the right to use his patented plan for removing carbon, said that he removed it every thirty days.

The President—How much oftener do you suppose you would have to burn the retorts out if you did not use valves?

Mr. Sherman—I would not have to burn them out any oftener, but I would have a much larger deposit to remove; or, instead of being able to burn out in eight hours, it would take thirty-six hours to do the work. The valve is not a specific remedy for the prevention of carbon deposit; but its advantage is that the formation is materially retarded.

Mr. Stedman—How long does it take you, Mr. Neal, to "burn off," when you "burn off" at such infrequent intervals?

Mr. Neal—It takes less than five hours, performing the operation once in three months.

Mr. Sherman—At New Haven we burn out once a month; and it takes us twelve hours to do it.

Mr. Lamson—This brings up some old questions that we discussed years ago. I always took the ground that valves were of very little benefit, except to remove the pressure. Mr. Sherman says the only value he sees in the valve is that it prevents the accumulation of carbon. We burn out about once in six weeks. The operation takes anywhere from six to twelve hours; and we have no valves. I do not see but that we can do it better without valves than we could with them. The only question is as to how much pressure we shall put on. If you had your retorts set in short sections, so that your main could be kept at a level, and so that you did not feel any risk in running with a very light seal, your accumulation of carbon would be small, no matter whether you used valves or not.

Mr. Sherman—I find a very great difference of opinion among superintendents with regard to the necessity of keeping the retorts free from carbon. Some allow their retorts to fill up for a goodly portion of their entire length. I have seen pieces of carbon taken out of retorts that certainly must have reduced their capacity two-thirds. I do not make gas in that way. It takes just as much fuel and labor to run a retort when two-thirds filled as it does when it is kept clean. I intend to keep our retorts free. Of course I could let them run for three months, or for six months; but it is not policy to do so.

Mr. Nettleton—I am glad that Mr. Lamson made the statement that he did in regard to the time required to burn out retorts. I have heard friends of mine say that it took from 12 to 24 hours to burn out a retort with steam, and I never could understand it. My retorts are burned out once in two or three months, and the operation occupies from five to eight hours. It never takes longer than that. The quantity of carbon is not large, and valves are not used. I believe that Mr. Yorke, of Portland, has had a large experience with valves; and I understand that he makes no carbon whatever.

Mr. Yorke—I have been able to hear but a little of the debate, but I understand that the question before the Association is as to the cause of deposit in retorts.

The President—The question before the Association now is, "How much carbon you have in your works at Portland?" We understand that you use valves, and that you have very little carbon deposited; is that so?

Mr. Yorke—Yes. I use an arrangement quite similar in principle to the valve. I cannot state the proportion of carbon; but it is very small. I am satisfied that the causes of the deposit of carbon are high heats and pressure. I have no deposit of carbon, no matter how high the heats may be. The quantity of carbon deposited is, I should think, partly owing to the material carbonized. If it be very rich in carbon, with the same heat and the same pressure, the greater will be the deposit of fixed carbon. If it be very poor coal, the deposit will be less. We use paraffine oil as an enricher for our gas. As a usual thing the pressure on our retorts will be a trifle less than one-tenth of an inch. In the retorts that we use the oil in, the deposit of carbon is much greater than where the oil is not used. A year or two ago I ran for several months with no pressure on my retorts. They were perfectly sound, so that I could risk running them in that way. The result was that I had not the slightest deposit at the back end of retorts. This satisfied me, beyond a doubt, that the cause of deposit was pressure. A short time since I was surprised to read about a discussion on this matter, taking place, I think, before the American Association, in which a certain gentleman gave it as his opinion that pressure in the retorts had very little to do with the quantity of gas obtained per pound of coal. I had always thought very highly of that gentleman's opinion, but that assertion changed my views regarding him. The greater the proportion of carbon deposited, of course the poorer the gas will be. The quality of the gas is deteriorated by just the amount of carbon thrown down in the retorts. There can be no doubt about it.

Mr. Harbison—How often does Mr. Yorke have to burn the carbon out of his retorts? How long does it take him to do it? And how does he do it?

Mr. Yorke—We have about one-tenth pressure on the retorts; and we have had to burn them out once in three or four months.

The President—How long does it take you to do it?

Mr. Yorke—We generally consume from 36 to 48 hours; and we do it by the old process—that of putting in air pipes. I should say the average time was 36 hours.

The President—The next question is,

"Is it cheaper and better to use iron sponge, and allow the carbonic acid to remain in the gas, and make up the deficiency by using oil, or to use lime purification?"

I have no doubt the Association has a pretty strong opinion, either one side or the other, on this question. I hope the members will be prompt to express that opinion. Let us first hear from some of the gentlemen who use iron sponge. I believe Mr. Prichard has said that he employs the sponge.

Mr. Prichard—We use the iron sponge entirely; and perhaps we lead the Association in the amount of carbonic acid contained in our gas. It is a question to my mind whether it is cheaper to let that carbonic acid remain and afterwards enrich the gas, or to use lime and remove the impurity. We are able to produce a very high candle power. From report of the State Inspector for last six months, we ran considerably over 18-candle power; and yet we have two per cent. of carbonic acid. When we can buy naphtha very cheaply, and lime for purification costs us three times the price of iron sponge, it really becomes a serious question as to which is the cheaper. Some figures made by me some time ago showed the cost of purification with iron sponge (figuring all the labor, and one-fourth of the cost of the material for six months' use,) to be eight-tenths of a cent per thousand feet. It would cost me, I think, one cent more to take out the carbonic acid. Now I can run the candle power up to a value that will offset all the carbonic acid deterioration, and at a less cost for the enricher than would be the case did I extract the ingredient with lime purification.

The President—You have two per cent. of carbonic acid at the outlet?

Mr. Prichard—Very nearly; it is 1.78, I believe.

Mr. Neal—I use iron sponge; and do so since I find the practice profitable. Even if I thought the candle power was very much diminished by the use of iron sponge, and found it necessary to add a larger quantity of naphtha for enriching, I should still employ the sponge. I think that the State Inspector, in his report on the testing of our gas, places the contained carbonic acid at about 1.3 per cent. I do not think the presence of carbonic acid diminishes the candle power of gas to as great an extent as is generally supposed. Theoretically the diminution is considerable; but practically the deterioration is slight. Our candle power, as brought up by the use of naphtha in the manner previously described by me, has been very much improved during the past six months. The cost of iron sponge is comparatively small, because it is good for at least two years of duty; and in its use there is no extra expense for labor. When our purifiers are changed the men from the retort house are quite able to perform the task.

Mr. Sherman—I would like to ask Mr. Prichard what he considers to be the depreciation in candle power resulting from the two per cent. of carbonic acid contained in his finished gas?

Mr. Prichard—The assertion made by our State Inspector (whom we all recognize as high authority in such matters) is that two per cent. of carbonic acid will reduce the illuminating value of an eighteen candle gas by one candle. In passing the gas through a lime purifier all the increase I could obtain by that purification was one-half a candle. From that it would seem as though there were a discrepancy of one-half a candle between the practical result of my experiment and the theoretical statement of State Inspector Hinman.

The President—Was the gas clean when it came out of the lime purifier?

Mr. Prichard—It was as clean as any one could make it by passing it through lime.

Mr. Sherman—It was the theory of Mr. Hinman's predecessor that the percentage of carbonic acid contained was an index to the percentage of loss in candle power—that is, two per cent. of carbonic acid would indicate a loss of two candle power.

Mr. Prichard—Mr. Hinman says, in his report of last year, that two per cent. produces a reduction of one candle.

Mr. Learned—I think that depends upon whether you do or do not test the gas with an argand burner. The other day I made some calculations on this subject. Assuming that you have an eighteen candle gas, and that its power was reduced by half a candle through the fact of the presence of carbonic acid, then the question is, "What will be the cost of the oil needed to increase the value of a thousand feet of gas from seventeen and a half to eighteen candles?" I calculated that it would take (assuming that a gallon of oil would make sixty feet of sixty candle gas) twelve-sixtieths, or one-fifth of a gallon to do the work. With naphtha at five cents, the cost would be

one cent. Mr. Prichard says that his iron purification (including labor and material) costs him about eight-tenths of a cent. Now, that would be equivalent to one and eight-tenths of a cent (assuming that he used oil) with iron purification. There was a time when we used lime for purification altogether. We now employ half sponge and half lime. Exclusive purification with lime cost us in the neighborhood of three cents for both labor and material. It seems to me, under Mr. Prichard's conditions, it is cheaper for him to use iron sponge, and then make up the deficiency by the use of oil.

The President—I think that Mr. Sherman, when he was at Worcester, had some experience with iron purification.

Mr. Sherman—I have had no experience with the iron sponge. I used the Cartwright preparation when at Worcester; and I there found if we attempted to remove the carbonic acid it took as much lime to remove that as it did the sulphur in combination with it. In other words, if you wanted to remove the carbonic acid there was no object in using the Cartwright preparation. You have got to use as much lime to remove the carbonic acid as you would have to use to remove the sulphur.

The President—What effect did that have on the candle power?

Mr. Sherman—The State Inspector (Mr. Stimpson) claimed that it reduced our candle power by 2 candles. I made it about 1½ candles.

The President—If it takes out 1½ candles, then the question is, "How much does it take to put that 1½ candles back again, as compared to the cost of purification?"

Mr. Sherman—If the gentleman was restricted to an 18-candle gas, I think it would make very little difference to him. If that is to be the standard, I fail to see any material loss in using iron sponge.

Mr. Learned—I do not think there is as much carbonic acid in the gas as the gentleman speaks of. According to the State Inspector's report our gas at Newton, as shown in one analysis, had 1.24; had 1.8 on another occasion; and contained 1.7 in still another. In some other analyses, made for the detection of carbonic acid, I believe the highest I have ever seen was not over 2 per cent.

The President—For the Boston gas the analysis showed 1.08.

Mr. Sherman—I remember that a very eminent engineer figured it in such a way to me as would cast out the iron sponge at once. He stated (and almost convinced me) that he had reduced the price of gas to consumers 50 cents by raising the candle power from 14 to 16. He did it in this way: He was selling gas at $3.50, which he said was 25 cents for each candle power; and, raising the power 2 candles, he claimed that he had reduced the price to consumers by 50 cents. (Laughter.)

The President—Some of the gentlemen who have been building new gas works must have been giving this subject considerable attention. We would like to know what Mr. Wood, of Syracuse, N. Y., thinks about iron sponge.

Mr. Wood—I have had no experience with iron sponge. We are in a section favored with an abundance of the best sort of stone lime. We succeed very well with that. We get it delivered at our works, just as it comes from the kilns, at 10 cents per bushel; and each bushel of it that we purchase will slack out to about 2½ bushels of hydrate of lime. We purify from 18,000 to 20,000 feet per bushel of lime. Last year our lime purification cost us, including labor, 1.2 cents per thousand feet.

The President—Mr. Stiness, did you consider the question of the use of iron sponge in your purifiers?

Mr. Stiness—Yes; we did. While I had many friends who were using it, still I failed to get from them a satisfactory answer to some questions which I put to them. I have always been rather positive in my opinions on this question, and my past and present practice is in accordance with that pursued by Mr. Wood. For the year 1884 the lime purification, independent of the labor of changing the purifiers, cost 1¼ cents per thousand cubic feet of gas made. I have always felt that when it did not cost over 2 cents per thousand feet to purify the gas I could better devote the few remaining years of my life to the benefit of my company in directions where we could save more than 2 cents per thousand; and I believe the right place to make that investigation is in the retort house. I never yet found an engineer who could give thoroughly satisfactory answers to my questions with regard to the use of iron sponge. I employed it years ago and abandoned it. I now adhere to the old custom—that of using shavings and lime.

The President—Does the iron sponge possess any value after ceasing to be useful for purification?

Mr. Neal—I have used it, but when spent I have never found any value in it except perhaps to fill in a wall. It is quite useful for that—quite as good as the clinkers.

The President—What is the cost, per thousand cubic feet of gas, of iron purification? At what do you figure the cost of iron purification?

Mr. Neal—The iron sponge cost us, last year, $250 for a quantity sufficient to purify between 60 and 70 million feet. There is no more labor with it than there is with lime.

The President—And how much was that?

Mr. Neal—Not any; we used the labor of the same men who changed the purifiers.

Mr. Prichard—With us the cost for the last two years was four-tenths of a cent for the iron alone, and the labor would be about the same; or a cost for material and labor of eight-tenths of one cent. When we used lime it cost us 3 cents.

The President—You calculate something over 2 cents as the total cost of it?

Mr. Prichard—That is the total cost of it, as I have to enrich the gas with something else in order to make up for the carbonic acid.

Mr. Sherman—At the price we paid ($4.35) for Westmoreland and Penn coal, and obtaining a 16-candle gas, the cost would be about 27 cents per candle power. If you then had to bring the candle power up, you would then have to add say 6 per cent. of enriching material to it; and this would make the candle power cost 4 cents more. In that light I do not see that there is any saving gained by the use of the sponge. The cost of the finished product is 27 cents per candle power; and it is what you can get at same cost from Westmoreland coal. Even to the latter you would have to add enricher enough to bring its cost up to 30 cents, so as to get the proper candle power, provided the carbonic acid was present.

Mr. Prichard—If you produce such candle power from coal alone it might cost that; but when you introduce naphtha, with the yield you can obtain from it, and the heat which you get with it (which indirectly brings additional candle power), then, of course, it will not work out that way.

The President—The next question is—

"*What is the effect of wet coal upon the illuminating power of the gas made from it?*"

I suppose everybody present possesses some general notion about that. Col. Stedman, what do you consider to be the effect of wet coal on gas?

Mr. Stedman—I am sure that I have not thought enough upon the subject to give an opinion about it. We generally store our coal very carefully under cover, in order to prevent it from being wet when used. We regard it as a matter of economy to use dry coal in the retorts. I have never looked for the chemical effects at all.

The President—We have a mine of wealth with us which we have not tapped as yet. We would like to hear what Mr. Thomas has to say on this subject.

Mr. Thomas—I have always considered it a great disadvantage to carbonize wet coal. I have always found it advantageous to have the coal stored so that it might be kept thoroughly dry. I claim that the drier the coal is when put into the retorts the better are the carbonization results obtained. Some years ago we were put to the necessity of allowing a portion of our coal supply to remain exposed to the influence of atmospheric change—owing to inadequate shed capacity—and the result was that the yield (making a comparison between the same grade of coal when wet and dry) ran down by one-half foot per pound. The yield from the coal when wet would be 4.25; when dry, 4.75. In the winter season we would take in a good deal of ice with the coal; and with so much water added we could not expect to produce the average yield per pound. I think it is an advantage, in every respect, to use dry coal; and further, there is no doubt at all in my mind that the sooner coal is used after its extraction from the mines the larger will its producing qualities be found. Take freshly mined coal and carbonize it, and you will secure a much better yield than can be obtained from the same coal kept stored for two or three months. I once made some experiments on this last named point, and their outcome was entirely in accordance with the assertions just made. If perfectly dry coal will deteriorate simply by lying in storehouse, it will certainly deteriorate much faster if wet. I think the drier the coal is the better result you will get—you will certainly get a better result in working the retorts, and you will get better gas.

The President—Suppose you contracted for the delivery of a cargo of dry coal, but when the vessel came alongside the shipment was delivered in a wet state; would you consider a damage of 10 per cent. had been done to the coal?

Mr. Thomas—It would depend upon how wet it was. I have taken coal and evaporated from it 5 per cent. of water; but still that was undoubtedly an abnormal case. The contained moisture will vary between 2 and 5 per cent. Now, if you pay for from 2 to 5 per cent. of water you throw away just so much money.

Mr. Slater—I think that Mr. Humphreys has made some experiments bearing on this subject—more particularly with regard to fine coal. Perhaps he has also inquired into the subject of wet coal.

Mr. Humphreys—I do not remember to have made any experiments with regard to wet coal. I have tested the fine coal as against lump coal, but I do not remember my exact figures.* I found that the lump coal was much better, but just how much better I do not know. In testing wet coal against

* See JOURNAL, Vol. XLI., pp. 171-2.

dry coal, I do not remember that I have ever made any such test as would enable me to give the figures from memory. Of course, if the coal is delivered to you wet, the loss will depend greatly upon whether it is lump coal or fine coal. I know that I had some fine coal which was delivered to me when it was quite wet; the portion I was obliged to use while in the wet state certainly gave me results 15 per cent. poorer than those obtained from the same coal when it was dry.

The President—We have had some wet coal sent out to us during the last year. It formed, I think, a portion of two cargoes; and according to my recollection the make fell off about two-tenths of a foot each time. Using the dry coal from the shed in some benches, and making a comparison with other benches charged with the wet coal as taken directly from the vessel (making the test several times), we found that the make fell off about two-tenths of a foot per pound of coal. This, of course, means the loss of a large quantity of gas. I do not believe the candle power is very greatly affected. The loss is in the shrinkage of yield.

Mr. Snow—A year ago this winter we had a cargo of wet coal delivered at our works, and we found that the yield ran down from 4.9 to 4.7, and also brought the candle power down from 17 to 15.

The President—Then you fell off two-tenths of a foot, or just about as we did.

Mr. Yorke—I would ask the gentleman whether, in taking the weight of the coal, he allowed anything for the weight of the water?

Mr. Snow—No; we weighed it up wet, the same as if it were dry.

Mr. Yorke—The yield per pound of coal will certainly vary according to the amount of contained water. One particularly bad feature is that the wetter the coal the greater will it reduce the heat of the retort. If you have 5 per cent. of water in your coal, and make allowance for that extra weight—or, say, weigh out 105 pounds of the wet coal, and call it but 100 pounds—the yield would probably be about the same, if you also make due note of the reduction in the heats.

The President—Then, if you have a cargo of coal which is wet, it would fall of about 5 per cent.?

Mr. Yorke—The falling off would of course be determined by the amount of water in the coal. I think I should allow, generally speaking, about 5 per cent. On one or two occasions when we have received wet coal, we have weighed the wet material and then have dried it, so as to ascertain the weight of contained water, and in order to have the shippers grant us the proper allowance. We have had this weight to vary from 3 to 6 per cent., and on fine coal it was really a trifle more than 6 per cent. But, of course, if we weigh the water as coal our production per pound would naturally fall off.

The President—You would hardly weigh in 5 per cent. of water if your coal was lump.

Mr. Wood—We have occasionally used wet coal, and I have always found that at such times of carbonization our candle power would depreciate, as would also the quantity of gas obtained. I do not know that this has been the general observation; but such has been my unvarying experience.

The President—As a rule, what would be the loss in candle power?

Mr. Wood—From 1 to 1½ candles, varying with the amount of water in the coal.

The President—The statements here made by one or two gentlemen are to the effect that the candle power and make fall off between 5 and 10 per cent. I think these facts are valuable, because there is not one in attendance here but who, one time or another, has had to ask from his coal shippers a rebate on wet cargoes. If it be true that the candle power falls off 10 per cent. and the yield shrinks by about 5 per cent., the wet coal question assumes a most serious phase; for a loss of 10 per cent. in candle power and 5 per cent. in yield would make a difference of at least 50 cents per ton in the value of a coal. If there is a coal shipper in the room we would like to hear what he has to say about it.

Mr. Copp—I would like to ask the President what his experience was with coal shipped to him in steamers—if it did not come to him finer? If I remember rightly he had some coal which was shipped in steamers to the Boston works, and that the coal was dried out to such an extent that it became pulverized on the voyage. Was it hot, although perfectly dry, thereby very much decreased in value?

The President—Mr. Lamson was Superintendent of the works at the time, and possibly he can give you the information.

Mr. Lamson—I understand, Mr. Copp, that in your judgment some of the value of that coal was distilled out of it by being so very dry.

Mr. Copp—I believe that it was considered to have been somewhat damaged.

Mr. Lamson—There was a discussion as to the value of certain coal, and in the discussion between the coal factors and the gas management the argument was brought forward that the coal had been rendered fine in transit on account of the heat of the steamers. I never believed that in any way, shape or manner. I did not place any credence in that claim then, and do not today. I believe that the argument had no reasonable foundation. In order to prove to the people who had been arguing on that side of the question, and to show that the heat would not disintegrate the coal in such a short period of time as that taken up by the voyage, I had the coal put into a carefully-prepared receptacle—taking lumps as large as one's fist, and being careful to pick it all over so as to have only lumps—and placed it on top of the retort stack, keeping it there during ten times as long a period as it would have taken to make the voyage in the steamer. The test proved that the heat did not affect it a particle. The damage, in my opinion, was not caused by the disintegration as a consequence of excessive heat experienced on the voyage, but was merely a result of some peculiarities having their origin in the different shafts of the collieries from which the coals were mined.

Mr. Sherman—I once saw a report that an engineer made to his board of directors with regard to the value of different coals, and in it he figured up that a coal which would make two thousand feet more per ton than another coal, was worth the price at which the gas was sold per thousand feet—in his case it was worth $8 per ton more. If that principle should be applied to our method of settling with our coal friends in our damage arbitrations about wet coal, I think they would owe us something.

Mr. Copp—I had no pecuniary interest in the cargo of coal of which I spoke; but I knew that there was some discussion had as to the condition of the coal which came by steamers, as compared with the condition of the coal received from sailing vessels.

Mr. Lamson—But, when the thing was worked out, it came down to the question of what shafts the coal came from. The question whether it had come by steamer or by sailing vessel was proved to be practically of no importance; and the question about heating the coal and disintegrating it I believed to be just about as unimportant. The whole thing came down to the point that the difference in the coal was due to the fact that it came from different shafts.

Mr. Copp—It may be possible that the difference was owing to the fact that coal from one shaft was more friable than that which came from another shaft.

Mr. Lamson—I always took the ground, and I feel as clear about it now as I did then, that there is no visible effect or difference exerted upon coal as between that which comes by steamer or by sailing vessel. I do not believe that the heat of the sun upon the coal carried on the deck of a vessel, or the heat of the boilers in a steamer, would have any appreciable effect upon the value of a coal.

The President—Do I understand Mr. Copp to contend that he considers it rather a good thing to have the coal wet?

Mr. Copp—From which standpoint am I to answer—in my position as a coal man or a gas man? As a gas man I would rather prefer to have dry coal.

Mr. Taber—Would not the matter of wet coal be somewhat dependent upon the character of the contained water? If the coal is wet from sea water undoubtedly it will be poor stuff to carbonize. There can be no question about that. If, however, the coal has been wetted only with rain water, or that which has fallen during the time of transit—whether or not it is thereby greatly injured—may be a subject for discussion. There is no question at all with regard to the deleterious effect of sea water on the coal.

Mr. Lamson—In that case the coal would be worse if it came in a sailing vessel than if it came in a steamer; because in a steamer no water gets into the coal.

Mr. Taber—Sometimes sailing vessels will wet the coal down in order to make the tonnage greater.

Mr. Copp—Is it not the fact that the Boston Gas Light Company have always kept their richest coal out of doors?

The President—We used to keep it out of doors.

Mr. Copp—Because you thought that the water would help it?

The President—Because we did not think it worth while to put a shed over it. As the coal had been paid for when dry, it did not make much difference. Now that we are using a larger percentage of cannel coal than we formerly did, we have seriously considered the damage which was done to that cannel from being kept out in the open air; and have debated whether it would not pay to put a shed over it. We have no doubt that the snow which falls on to the coal and the ice which forms on it in the winter does have an effect upon the yield; and if for no other reason because it has an effect upon the temperature of the retorts. Some coals will take up water just like a sponge. As an example of the way that the Albert coal will hold water (we have not purchased any for some years, but have once or twice changed the position of our present stock), we do not know yet how much we will make on the transaction; but my impression is that we have some four hundred tons of Albert coal that will not stand us in anything. We estimate that we have got six hundred tons of coal in one pile, while it stands on our books as only one hundred and fifty tons.

[To be Continued.]

[Official Report.—Continued from page 207.]

Papers Read before the First Annual Meeting of the Ohio Gas Light Association, with Discussions on Same.

First Day.—Afternoon Session.

With the close of discussion on Mr. Butterworth's paper on natural gas, President Hickenlooper said that Mr. Emerson McMillin would claim the attention of the Association. The latter gentleman then read the following paper on the question of—

DO WE GAIN HEAT, OR SAVE FUEL, BY PASSING STEAM THROUGH OUR GRATE BARS?

Evaporating water from the ashpans of furnaces, and passing the steam therefrom through the grate bars certainly is a practice as old as is the gas business itself. This being a fact, it seems strange that it should be thought necessary to propound the question contained in the title of this paper.

I take it that, directly or indirectly, advantage is gained by such use of steam; or, otherwise, the practice would be abandoned. The importance of the subject is only realized when we undertake to prove either an affirmative or negative answer to the question asked.

The quantity of water evaporated from the ashpan of an ordinary fire, heating six retorts, will vary from 300 to 600 pounds per 24 hours. The quantity will be largely influenced by the height of grate bars above the surface of the water. The average will be about 500 pounds. This same furnace will consume probably 40 per cent. of the coke made in the retorts heated by it; or, say, 2,000 pounds of carbon, which gives the ratio of one of water to four of carbon.

My attention was first called to this subject by Mr. C. F. Prichard, Engineer and Superintendent to the Lynn (Mass.) Gas Light Company. He questioned the propriety of using water; and asserted that it resulted in adding neither intensity nor quantity of heat to the retorts.

I believed he was wrong as to intensity, but probably right as to quantity. A friendly exchange of letters soon convinced me that prior to the inception of the correspondence I had no right conception of the magnitude and importance of the question. I am now, however, satisfied that neither intensity nor quantity of heat is added to the fire of the *ordinary coke furnace*, but, on the contrary, that both are reduced by the use of water vapor. Nevertheless the loss seems to be necessary, as, without the use of steam, the fires become clogged with clinker.

In the combustion chamber of a gas furnace, however, the loss, if any, will not be so great as with the coke furnace; and indeed I think I can show a positive gain. I designate as "coke furnace" the old manner of firing; and by "gas furnace" mean the system of generating carbonic oxide with the coke, and heating retorts by secondary combustion.

The system of firing that does not attempt to utilize the heat of primary combustion in heating retorts, and that evaporates the water by the waste heat from the escape flues, will sustain less loss, or, possibly, it would be better to say, derives more benefit from the use of steam than will other modes of firing. That is true, I think, for this reason: The quantity and intensity of heat generated by *secondary* combustion is much greater when steam is used than when it is not, though the total heat of primary and secondary combustion will be less as the quantity of water used is increased.

If I rightly understand the construction of the furnaces at the Boston (Mass.) Gas Works, I think they will derive more benefit from the use of steam than would be gained by the use of steam in the Cincinnati (Ohio) furnace plan; yet I believe the Cincinnati arrangement to be the better and more economical.

Col. W. A. Stedman, at the New York meeting of the American Gas Light Association, held in October, 1883, gave us more detailed data respecting the working of the gas furnace than I have been able to find elsewhere. I will, therefore, place myself under obligation to him by using the data so given in my effort to throw light upon the subject of this paper.

Col. Stedman, in a seven days' experiment, used or consumed an average of 7.42 bushels of coke per ton (2,240 pounds) of coal carbonized. This equals 11.6 pounds per 100 pounds of coal—the coke weighed, when hot, 35 pounds to the bushel. This weight (11.6 pounds) of coke would equal about 10.5 pounds of pure carbon per 100 pounds of coal carbonized. The average charge per retort during the experiment was 330 pounds. This equals 11,880 pounds coal for a run of 24 hours, in a bench of sixes, charging every four hours. Now if he used 10.5 pounds carbon for each 100 pounds of coal, he would consume a total of 1,247.4 pounds; or say, 1,250 pounds carbon in 24 hours. The quantity of water evaporated was 80 pounds per hour, which equals 1,920 pounds in 24 hours, or more than 1.5 of water to one of carbon. Yet Col. Stedman thinks that more water (during the heavy charging) could have been used to advantage.

From the data given by Col. Stedman I calculate that there was entering his furnaces, for primary combustion, about 80,000 feet of air, or about 1,400 pounds of oxygen per 24 hours, which would convert 1,050 pounds carbon to CO; and if no carbonic acid was formed, there would be 200 pounds of carbon remaining to be consumed by the oxygen of the water. This would require only 300 pounds of the water to supply the requisite quantity (267 pounds) of oxygen. If this be true, what becomes of the remaining 1,620 pounds of water? Is it possible that it can pass through four feet of incandescent coke and not be decomposed? Or, is it more probable that a large part of the oxygen of the air passes through the hot mass of carbon and escapes combination?

The water would furnish 1,707 pounds of oxygen, which would combine with 1,280 pounds of carbon (to form CO) which is 30 pounds more than the total carbon used. Therefore, if enough oxygen of the air is united with the carbon to maintain the proper heat in the furnace, it is impossible for even half of the water to be decomposed. There is too much water if the oxygen of the air sent in is utilized, and too much air if but half the water is decomposed.

I think, however, it is possible that less air entered for primary combustion than Col. Stedman supposes, and my own experience with a similar furnace leads me to this conclusion. It is possible to set the openings for the ingress of air for secondary combustion so as to give a fixed quantity. Not so with the primary supply. The velocity will be constantly changing. Immediately after the ashes are shaken out of the furnace the velocity will be great; but will be continually decreasing until the operation of stirring out the ashes is repeated.

Experiments recorded in "Percy's Fuel" show the following results obtained from passing steam through red-hot coke; and in connection with these experiments it is asserted that the depth of the coke did not materially influence results; gas obtained in volume—hydrogen, 54.22; light carburetted hydrogen, 1.62; carbonic oxide, 31.86; carbonic acid, 12.30; total, 100. This shows that nearly 27 per cent. of the carbon taken up was in the form of carbonic acid. This is a much greater loss than is popularly supposed to be sustained; and I think more than double what the loss would be in a furnace of the form, and with the depth of coke, used by Stedman.

In my investigation of this subject I shall therefore assume that not more than ten per cent. of the carbon is consumed to carbonic acid in the producer, the remaining ninety per cent. uniting with oxygen to form carbonic oxide. Upon this basis of calculation, if all the water vapor sent into the furnace (1,920 pounds) should be decomposed, this vapor alone would give up oxygen enough to consume 1,155 pounds of the 1,250 pounds of carbon used. But could this be accomplished and the heats be maintained high enough for decomposition?

The heat lost by the decomposition of 1,920 pounds of water will be equal to the heat produced by the oxidation of the quantity of hydrogen (213 pounds) contained in 1,920 pounds of steam. The calculation will then stand thus: $213 \times 62{,}500 = 13{,}312{,}500$ units of heat lost by the decomposition. From the figures showing the loss, however, must be deducted the heat produced by the union of oxygen with the carbon in the process of dissociation, the heat carried in by the steam, and the heat produced by the union of oxygen from the air used in the conversion of the 95 pounds of carbon not required for the decomposition of the water vapor.

	Units.
Carried in by 1,920 pounds of steam, $1{,}920 \times (966+212) =$	2,261,760
Produced by the union of 1,374 pounds oxygen from the water, with 1,125 pounds carbon to form CO, $1{,}125 \times 4{,}200 =$	4,725,000
Ninety-five pounds carbon uniting with oxygen of the air, $95 \times 4{,}200 =$	399,000
Three hundred and thirty-three pounds oxygen of the water uniting with 125 pounds carbon to form carbonic acid, $125 \times 14{,}000 =$	1,750,000
Giving a total heat produced, and carried in by steam, of	9,135,760

This sum deducted from loss by decomposition shows the net loss to be 4,176,740 units of heat; thus clearly showing that not all nor even one-half of the steam could have been decomposed. It would require an additional 299 pounds of carbon to be consumed to carbonic acid to produce heat equal to the loss of decomposition; to say nothing of the large additional quantity that would be required to heat the resulting products to the temperature necessary for the decomposition of steam—say to 1,200° or 1,500° F.

Then, instead of Col. Stedman being able to use more than 80 pounds of water per hour to advantage, he should have reduced the quantity he was using to not more than 25 pounds per hour; and even less than that quantity would be still better.

Now, if I am right in my conjecture that not more than a total of 25 pounds weight of water per hour was being decomposed, then to raise the other 55 pounds (1,320 pounds in 24 hours) from 212° to the temperature of the combustion chamber—say 2,500° F.—required 17.25 per cent. of the total fuel used. Was this expenditure of fuel necessary to prevent the formation of clinker? I think not. The temperature of the furnace may be kept as low as desired, and yet pass no water vapor through the furnace undecomposed,

I will now present the work of another furnace, using 600 pounds of water per day of 24 hours; and as the furnace we have been considering gave results much above the average, I take one that gives more nearly average results—one using 25 per cent. of its coke, or say 1,500 pounds of carbon. The ratio would then be 2.5 of carbon to one of water. I will assume that 10 per cent. of the carbon is consumed to carbonic acid, 90 per cent. being converted into carbonic oxide, in the producer or furnace proper, or the same as was done in preceding calculation.

The 600 pounds of water represents 533 pounds of oxygen and 67 pounds of hydrogen. The oxygen will combine with 400 pounds of carbon to form 933 pounds of CO; 150 pounds (or 10 per cent.) of the carbon will unite with 400 pounds of oxygen of the air to form 550 pounds of carbonic acid; and the remaining 950 pounds of carbon will unite with 1,267 pounds oxygen of the air to form 2,217 pounds CO. This introduces 5,837 pounds of nitrogen. The total heat of the producer, or furnace, now stands thus:

		Units.
Heat of steam	(212 + 966) × 600 pounds =	706,800
Carbon to CO	1,350 pounds × 4,200 =	5,670,000
Carbon to carbonic acid	150 pounds × 14,000 =	2,100,000
Heat of air	7,500 pounds × 60° × .238 =	107,100
Total quantity of heat		8,583,900
From this must be deducted loss of water dissociation. The 600 pounds water contained, hydrogen	67 pounds × 62,500 =	4,187,500
Leaving net quantity of heat		4,396,400

Now, it will be necessary to show that even 600 pounds of water vapor can be decomposed, and the heat of the producer maintained. To ascertain the temperature of the furnace we divide the net units of heat by the weight of the gases produced, multiplied by their specific heat. The resultant gases are as follows:

3,150 pounds	carbonic oxide	×	specific heat,	.2480, =	781.200
5,837 "	nitrogen	×	"	.2440, =	1,424.228
550 "	carbonic acid	×	"	.2164, =	119.020
67 "	hydrogen	×	"	3.4000, =	227.800
9,604 pounds	gases	×	"	.26575, =	2,552.248

The total net quantity of heat units, 4,396,400, divided by 2,552, equals 1,726° F. as the temperature of the producer, allowing no loss for radiation—that source of loss being about the same whether water vapor is or is not used, and the item is ignored in all the calculations.

The 1,726° F. was the highest possible temperature to be obtained under the conditions named, and certainly much above the real temperature. The inside of the walls toward the top of our producers are often only dark red. I shall therefore assume that the temperature of the gases entering the combustion chamber do not exceed 1,400° F., and then proceed to calculate the temperature attained in the combustion chamber, stating in advance that the air entering the combustion chamber for secondary combustion is heated by waste gases to 300° F.

	Units.
Heat carried up from the furnace, in the gases, 9,604 pounds × 1,400° × specific heat, .26575, =	3,573,168
We must now introduce 1,800 pounds of oxygen to unite with 3,150 pounds of carbonic oxide, and 533 pounds of oxygen to unite with 67 pounds of hydrogen. With this 2,333 pounds of oxygen will enter 8,167 pounds of nitrogen. Total air entering for secondary combustion, 10,500 pounds × 300° × specific heat, .238, =	749,700
In putting 1,500 pounds carbon into the furnace we put in 1,650 pounds coke, drawn hot from the retorts, entering furnace at not less than 1,800°. This will carry in heat, 1,650 pounds × 1,800° × specific heat, .2, =	594,000
Heat produced by the combustion of hydrogen, 67 pounds × 62,500 — (966 units (latent) × 600 pounds) =	3,607,900
Carbonic oxide burning to carbonic acid, 3,150 pounds × 4,325 units =	13,623,750
Total heat	22,148,518

Now, to find the temperature of combustion chamber we follow the rule stated above for ascertaining the temperature of the producer—*i. e.*, multiply the weight of the resulting gases by their specific heat, and with resultant product divide the total heat units.

Carbonic acid	5,500 pounds	×	specific heat,	.2164, =	1,190
Nitrogen	14,000 "	×	"	.2440, =	3,416
Water	600 "	×	"	.4750, =	285
Gases	20,100 pounds	×	specific heat,	.2433, =	4,891

The total heat units, 22,148,518, divided by 4,891 equals 4,529° F., or the possible maximum temperature of the combustion chamber. In practice, of course, it is much below this, not only from radiation and convection of the material composing the benches, but to a still greater degree by the liquefaction and gasification of the coal in the retorts.

From the above calculations we can deduce this fact—that for every one degree of temperature of the escaping gases we will lose 4,981 units of heat, and for every 100 degrees we lose a little above 2.2 per cent. If the gases escape from the flue of the combustion chamber (of the furnace we have been considering) at 900°, the heat carried away will equal 19.88 per cent. of total heat. But as the calculations considered only the exact quantity of necessary air, both for primary and secondary combustion, and as such exactness is never attained, it might be considered good work if not more than 25 per cent. of the heat of the combustion chamber were carried off when the gases escape at 900°; or an approximate rule would be to consider that 3 per cent. of the value of your fuel is lost for each 100° F. temperature of the gases in the escape flues.

Now, there are two questions to be considered here: First, can we keep down the temperature of our producers without the use of steam? Second, can we have same temperature, or higher, in the combustion chamber with no water used as when the water used equals 1 to 2.5 of carbon?

To the first question, I say the temperature can be kept down and the required quantity of carbonic oxide generated by making the furnaces large and causing *slower* combustion in the producer; but whether the formation of clinker will be prevented when the fire is at that temperature necessary for decomposition of carbonic acid is a question about which I am not clear. The reduction of the metals of the ash begins at a very low temperature; and I take it that it is the province of the steam to prevent that reduction—to keep the metals oxidized to sesquioxides, at which degree of oxidation they will not melt to clinker at the temperature of our producers; but when these metals are reduced to protoxides they melt at low temperatures.

Whether the second question can be answered in the affirmative is purely a question of calculation. We will assume that if no water or steam is used it will be necessary by some other means to keep down the heat of the producer, so that clinkers will not choke up the furnace; and that the gases entering the combustion chamber for secondary combustion will be of the same temperature (1,400° F.) as the gas was estimated at in the preceding calculation when water was used.

Assuming the temperature as above, the heat carried from the furnace into combustion chamber will be as follows:

	Units.
550 pounds carbonic acid × 1,400° × specific heat, .2164, =	166,628
3,150 pounds carbonic oxide × 1,400° × specific heat, .2480, =	1,093,680
7,700 pounds nitrogen × 1,400° × specific heat, .2440, =	2,630,320
11,400 pounds gases × 1,400° × spec. heat, .24377, = total heat units,	3,890,628
Units of heat carried in by the hot coke: 1,650 pounds × 1,800° × specific heat, .2, =	594,000
Carried in by air for secondary combustion: 8,100 pounds × 300° × specific heat, .238, =	578,340
Generated by the combustion of carbonic oxide to carbonic acid: 3,150 pounds × 4,325 =	13,623,750
Total heat units	18,686,718

We now have the resultant gases as follows:

Carbonic acid, 5,500 pounds + nitrogen, 14,000 pounds, × specific heat, .2362, =	4606

Using these last figures as a divisor and the total heat units as a dividend (thus, 18,686,718 ÷ 4,606 = 4,057° F.), the product is the temperature of the furnace, ignoring loss by radiation, same as in preceding calculations.

This shows that the maximum temperature with the use of water vapor, in the proportion of one of water to 2.5 of carbon, is, or can be made, 470° F. greater than when no water is used.

But when no water is used there will be a loss of only 4,606 units for each degree of temperature of escaping gases, instead of a loss of 4,891 units, as sustained when water is used. When no water is used, however, and the gases escape at 900°, the loss equals 22.18 per cent. of the total heat units of the combustion chamber.

The results of these calculations demonstrate conclusively to my mind that we can both save fuel and gain intensity of temperature by the use of about 40 pounds of water vapor to 100 pounds of carbon, or 110 pounds of coke, when the coke is consumed in a producer furnace, and the gases burnt in a combustion chamber about the retorts. That with the ordinary shallow coke fire there is a loss sustained in using water, but the loss is a necessary one.

The result of experiments in works in weighing the water passed into our furnaces leads me to conclude that probably many gas works managers have but a faint conception of the weight of water daily evaporated from their ashpans, or sent through the grate bars as a steam jet.

Notwithstanding the fact that I have proven by figures (and who doubts the veracity of figures?) that great loss is sustained by the use of an excess

of water vapor, and, further, that more than one of H_2O to 2.5 of carbon *is an excess*, yet this thought "will not down:" Who can show better results from the working of their furnaces, where an excess of water has not been used, than has been shown by Stedman, where, apparently, great excess of water has been used? Therein, I think, lies food for reflection.

Discussion.

Mr. Fullagar—With regard to the idea advanced by Mr. McMillin, where he speaks of increasing the size of the furnace, I would like to inquire whether the increase advised would be made in area or depth?

Mr. McMillin—The area; not the depth. The object of substituting a larger furnace was to bring the oxygen of the atmosphere in contact with more fuel, obtaining the same quantity of gas during carbonization, but with slower combustion. If a nail lies out in the atmosphere and becomes completely rusted, its condition was occasioned through the action of heat just the same as though it had been brought about by a hot fire. You could not detect the heat conditions, simply because the combustion was so very slow.

Mr. Enfield—There seems to be some question among gas engineers as to whether the steam or water vapor is decomposed in passing through the regenerative furnace. For my part I have but little doubt about the matter. I think the vapor is decomposed into its constituents of hydrogen and oxygen. We all know—especially so with those who have had experience with the Lowe water gas process—that steam passed through incandescent fuel is broken up into its constituent gases; and we also know the gaseous mixture so produced is a permanent one—that it will stand confined in a holder for days at a time without important change. If this be so in that case why should not a like result happen with the steam passing through a furnace as we employ it? If so, we get the resulting gases which, together with the use of hot coke, and slow and perfect combustion, make up the aggregate of advantage and saving gained by working under the regenerative furnace system. It is rather a tedious and wearying task to figure up the different matters involved in a compilation of aggregate results; and while no doubt the calculation will prove the gain, those who have never made the figure comparison will readily acknowledge the great practical saving that follows the introduction of the regenerative system. I have seen old-style furnaces that absorbed 60 per cent. of the coke produced—very poor furnaces, indeed, were those; I know that others managed to get along with a fuel consumption of 33⅓ per cent., but I never yet have seen one that would work satisfactorily under an absorption of only 25 per cent. of the coke product. A regenerative furnace will give every satisfaction at the last named percentage of fuel supply, and do it continuously. We can see this fact practically demonstrated every day. The question of arriving at perfect combustion, I submit—no matter how it may be secured—is one of the most prominent and valuable topics for the consideration of the gas engineer of to-day. And I would assert as my opinion that, in regenerative firing, by the decomposition of steam in the furnace, and the passage of its resultant gases into the combustion chamber, acting as assistants to the other gases from the burning of the solid fuel, and there securing thorough combustion, we do get the best results that can be had.

President Hickenlooper here introduced Mr. John Fullagar, Engineer to the Cincinnati (Ohio) Gas Light Company, who read the following paper on the question of

DOES IT PAY TO USE ANY LIME IN CONNECTION WITH OXIDE OF IRON?

Mr. President and Gentlemen of the Ohio Association:—I have been called upon by your Executive Committee to read a paper upon the subject of lime in connection with hydrated peroxide of iron for purification; or, more properly stated, "Does it Pay to Use Hydrate of Lime for Removal of Carbonic Acid?"

It is well known that hydrated peroxide of iron for purification removes only the various sulphur compounds, and has no affinity for carbonic acid. I presume that any person familiar with the chemistry of gas making will admit the necessity for removal of the carbonic acid, as its presence deteriorates the illuminating value of the gas, and, to that extent, militates against a maximum production of a standard gas per ton of coal carbonized. Only one per cent. of carbonic acid in the gas reduces the candle power from 8 to 10 per cent.

The quantity of this impurity varies considerably, depending of course on the description of coal carbonized—the volume thereof in the gas ranging from zero to 4 per cent. A large portion of this is eliminated in the scrubber; but if only one-half of one per cent. remains in the gas after passing the oxide purifier it will certainly pay to remove it. To accomplish this it is necessary to resort to the use of hydrate of lime, as being the most efficient and cheapest agent for that purpose. The cost of lime for removal of this impurity is merely nominal, as one bushel of oxide of calcium will absorb fully 700 cubic feet of carbonic acid, or about 4.75 cubic feet per pound of hydrate.

By dispensing with the use of lime, and thus failing to abstract the carbonic acid, it would be necessary to use a large per cent. of enricher to maintain the illuminating power, or be satisfied with a decreased yield of gas per ton of coal carbonized to obtain a standard gas.

In view of these facts, I deem it expedient and profitable to use lime in conjunction with hydrated peroxide of iron for complete purification.

Discussion.

Mr. Hamlin—I presume there are some gentlemen here whose works are in capacity about the same as those I am interested in—4-inch connections. Formerly we had been using lime in purification, and found it very expensive. Finally we concluded to try iron borings, or sponge, and a short trial proved the new departure would cost us more than we had supposed. Then we purchased iron borings, adding sawdust thereto in the proportion of one pound sawdust to 30 pounds borings. We kept on altering the mixture until at last we fixed it at the ratio of 70 pounds borings to one bushel of sawdust. The substance appeared so dry that we at first sprinkled it. This plan not working well, we then tried it in a perfectly dry state. The lower layer in the purifier consisted of lime, in order that the impurity not extracted by the sponge would certainly be removed by the lime. We have now been using the mixture for a long time, and I must say it gives much better satisfaction than did the lime alone; also, it is cheaper. After it has been fouled we remove it from the boxes and allow it to revivify, in this way generally keeping three or four piles going through the process of revivification. It comes out black; we keep it exposed for five or six hours to sweeten up, and finally it resumes its original rusty color.

Mr. McMillin—There are a good many points of considerable interest in that paper. I understood the gentleman to read that one per cent. of contained carbonic acid would reduce the illuminating value of the gas from 8 to 10 per cent. I will agree that, if you take pure coal gas, without any carbonic acid gas in it, and add thereto one per cent. of carbonic acid gas, the addition would reduce the illuminating power very much; but I do not believe, if gas is purified with oxide of iron alone, and one per cent. of carbonic acid gas be thus left in, it will give 10 per cent. less light, nor 5 per cent., nor 1 per cent., nor any per cent. less than when purified with lime and all the carbonic acid taken out. I think, month in and month out, we will make a higher candle power using oxide alone than when using lime alone. I think if you use lime after the sulphur has been taken out you increase its value some; but as between the two systems of oxide and lime, you will get gas of higher power when purified by oxide than by lime.

Mr. McMillin here quoted from the report of the Massachusetts Gas Inspector's tables, and said:—Charlestown and Lynn are two places that use oxide only. At Charlestown the illuminating power is 17.01, and at Lynn 17.17. At the works named carbonic acid is anywhere from twice to ten times that in other Massachusetts towns; yet the illuminating power of the gas will average equal to or greater than the average of the other towns in that State. I do not believe you lose as much by allowing the carbonic acid to remain in the gas, when purifying with oxide alone, as you lose by taking out the rich carbonaceous oils carried along as vapors, when using lime exclusively. One has little idea of how much rich material he throws away when employing lime alone, unless he has tested it. For a time we filled some old discarded boxes with half lime and half coke, and took the mixture out after it had remained in the box for ten days. We then put it into a retort. The gas we had to purify was made from coal that gave four feet to the pound; we made two feet to the pound from the coke, breeze, and lime, and the product was just about as good gas as that given off by the coal. When you use lime and cast it aside every day, just see what, in the aggregate, you are throwing away. With us everything of that kind is lodged in these boxes mingled with coke screenings until the coke is saturated. Of course we never throw any oxides away. All the vapor that should be retained as permanent gas passes along with the gas. The oxide of iron and lime together is, I admit, perhaps better; but I do say that oxide is better than lime used alone.

Mr. Fullagar—Two years ago I found from experience when we were then using oxide alone, that carbonic acid gas was passing out very freely. To remedy this we placed a layer of lime on top of the oxide, and on the first day of the experiment our illuminating value was augmented by 1½ candles. One year ago we put 300 bushels of lime in the purifying house, and it is in use to-day. From letters received by me, I found the reason why other parties did not want to use oxide alone was because the candle power went down. I may say that this appears to be the general complaint against exclusive purification with oxide.

Mr. McMillin—With regard to the use of enrichers at the Massachusetts gas works, spoken of by me, I admit that more or less of different enrichers are there employed. That does not change the position I have taken. The difference still remains. One has one-tenth of one per cent. carbonic acid in his gas, and the other has 1.75, yet the illuminating power is about the same. Mr. Hamlin spoke of first trying dampened oxide, but did not then succeed; yet when used dry he did. I think he attributed his success to the

wrong cause. I never knew the oxide to succeed at the first trial—at first time of asking it always fails; but I believe it will succeed better wet than dry; it will do better work when damp than when dry. The decomposition makes water. If it were always kept dry, and the oxide did not become hydrated, it would be a very poor purifier.

Mr. Enfield—For a great many months I used oxide of iron to purify the gas, placing about three inches of hydrate of lime on the top tray. The lime, instead of having the same color that it usually possesses when taking out sulphuretted hydrogen, was white; and the men around the works noticing its white condition, and apparently looking so much like what it did when it was first put in, concluded it had not done any work, and so might be left in action. In thinking the matter over I concluded this lime had taken up no sulphuretted hydrogen because the oxide had already extracted it, but that it had been charged with carbonic acid (CO_2) and could not do its work over again. As a result I determined we had better put in fresh lime every time we changed the oxide.

Mr. Fullagar arose to say that was the principle he was acting upon. He had had it close on to three years. If it were put in a separate purifier they would have its full value; otherwise just about one-half would be lost.

Mr. Enfield said a wrong inference might be gathered from the remarks made by Mr. Hamlin, who, while he was probably using an ordinary oxide of iron, yet it had not the same formula as the common sponge that the majority of the members were working with.

At this stage of the proceedings congratulatory telegrams from the New England Gas Light Association, letters from Mr. C. J. R. Humphreys, Secretary of the American Gas Light Association, Mr. A. W. Littleton, Secretary of the Western Gas Association, and from Mr. Jos. R. Thomas, Editor American Gas Light Journal, were read, and duly acknowledged.

In the absence of Mr. Jos. Light, of Dayton, Ohio, who had prepared a paper on "Circular Subject No. 6," entitled,

HOW MUCH COKE IS LOST AS SCREENINGS, AFTER BEING CRUSHED; AND WHAT ADVANCE MUST BE ADDED TO PRICE OF CRUSHED COKE TO MAKE IT EQUALLY PROFITABLE TO SELL BY GAS COMPANIES?

the Association's Secretary was instructed to read the communication. It was as follows:

Mr. President and Gentlemen:

The consumption of coke for fuel in private residences has become a very interesting item to all gas managers. It is but a few years since that coke was a drug in our home market; and, in fact, we could hardly give it away. I can recollect when the President of our company asked me if I could not suggest a plan by which we could get rid of our coke heaps. I told him I could; and my plan was to declare a dividend in coke, and compel each and every stockholder to take it from the premises whether he wanted it or not; but I could not get our chief officer to agree with me. Now, I am pleased to say, a great change has taken place; and the change has been so marked that we cannot supply the demand in the winter months.

How did this change take place? We began by selling the coke at a low price—in fact we gave some away in order to induce some of our citizens to try it. We also purchased a crusher, and broke or crushed the coke up so that it could be used in the anthracite self-feeding stoves. The subject which our Secretary asked me to bring before you is, "The loss incurred by crushing coke." That is rather difficult for me to determine; as a rule, the construction of the crushing machine will regulate that, some machines wasting more than others.

I will state the result as found by me at our works, which is as follows:

One hundred bushels of coke, weighing 3,600 pounds, yielded—

3,048	pounds, or	84½	bushels,	of crushed coke.
108	"	" 3	"	" pea coke.
444	"	" 12½	"	" dust.

We receive for the large coke, 10 cents per bushel, delivered.

100 bushels, at 10 cents	$10.00
Two men, one hour, at 15 cents	30
Fuel	12
Oil, wear and tear	09
	$10.51
Less the 3 bushels of pea coke, at 6c. per bushel	18
	$10.33

Then, 84½ bushels of crushed coke, to be equally profitable, must sell at twelve and one-fifth cents per bushel.

Discussion.

Mr. Bate—I cannot go into details or percentage of loss, etc.; but so far as getting rid of coke is concerned my experience may be of interest to parties who have not followed the plan of crushing. All gas managers who find a surplus of coke on hand should offer, as a first inducement to its use, to sell at whatever figure they can get. Nine years ago, or when I first went to Tiffin, no attempt had been made to sell the material. It was simply thrown into a nearby creek, They had been asking ten cents per bushel for the trifling lots they did find purchasers for. I did not believe in filling up that creek with a good fuel, and it accumulated quite rapidly. I cut the price down, and sold some 4,000 bushels at 4 cents a bushel. After selling that quantity the demand ceased, and the coke piles increased; and their magnitude became such that something had to be done. Here I might add that the tar was also being run into the creek, and the people located on its lower banks were complaining greatly. I at last suggested that the company make a trial of crushing the coke. They authorized me to make the necessary expenditure, and we went systematically to work. One temptation I held out to customers was similar to the practice outlined in Mr. Light's paper—that of giving away small portions for trial. I soon found the call for the fuel began to increase; and our local brewers tried the lump coke. Eventually the selling of coke assumed such proportions that I am now actually unable to supply one-tenth of the demands made upon us. Purchasers send their wagons for it, and often actually cart it away before we can cool it off. It is used by our consumers in preference to hard coal; and the preference is always shown to those who are regular consumers of our gas. Indeed our gas consuming patrons purchase our entire coke output. The price of hard coal at Massillon and in its vicinity has been as low as $3 per ton, and it often goes up to $6 and $7 per ton. I think, even if I increased the present price of my coke, I could sell it all without any trouble. At the yard we charge ten cents, and deliver it for twelve cents per bushel.

Mr. Converse—I made an experiment with our coke crusher to determine about how much was lost, by the crushing, in the shape of slack or waste. The experiment appeared to show that there was a shrinkage of about 15 per cent. We get 8 cents a bushel for lump coke, and obtain 9 cents for the crushed product. We possibly might sell our lump coke at a better price; but the demand for it is probably not so great. Now, as I can dispose of it all when the crushers are kept in operation, you may be sure that I will not risk a trial of the lump method. Bituminous coal in our town retails at $3.40 to $3.50 per ton.

Mr. Fullagar—In an experiment made by me on the crushing of a hundred bushels of coke, I did not find as great a shrinkage as that named by Mr. Converse. Having due regard to proper size of mesh, I find that if you crush 50 bushels of lump coke you cannot get the crushed product back into the 50 bushel measure. We do not sell our coke by weight.

Mr. Enfield—In view of the discussion to be had on this subject at this meeting it was suggested that I make an experiment at our works; and I did so. We took 100 bushels lump coke and put it through the crusher; after it had been run through we got as a return 83 bushels of nut, and 8 bushels of pea coke (from the smaller screen), with 8 bushels of dust. By weight we got back 3,320 pounds out of the original weight of 4,000—3,020 of nut, and 300 of pea. Where the rest went to I do not know. The men said I had about a bushel on my hat.

President Hickenlooper—Mr. Fullagar I think should have added that he first screened the lump coke from the other qualities, and afterwards separated the nut and pea sizes.

Mr. Fullagar—The loss would depend much upon what sort of a crusher was being operated. I believe the 15 per cent. loss spoken of by Mr. Converse is altogether too great a one. In my opinion the shrinkage should not exceed 8 per cent.

Mr. Kinsman (Springfield) stated that he sold his coke by weight.

Mr. Bushnell (Springfield) calculated they probably lost, through crushing, 3 bushels out of 25. By measure they quite likely got in the proportion of 10 cents for lump, and 12 for crushed coke.

Mr. Enfield—With reference to the relative quantity of coke that would fill a bushel, crushed or uncrushed, I might speak of an experience that we went through the other day. We had a rather large basket in our yard, and I determined to make a weight test with it. Filled with crushed coke it weighed 65 lbs—the weight of basket was six pounds. with an equal quantity of uncrushed coke, the gross weight was but 56 pounds. Now, if we would sell a bushel containing 2,688 cubic inches crushed coke at the same price obtained for a similar weight of uncrushed fuel, we would not be great gainers by the crushing; nor would it be a very profitable scheme to sell it at an advance of a penny per bushel.

Mr. Salter—Our experience in the South has been that we lose about 18 per cent. At present we do not crush our coke. We dispose of it all in the lump.

Mr. Huntington—We should never have put a crusher up at Columbus except to get rid of the coke, which, in the lump state, constantly accumulated on our hands.

Mr. Coverdale stated that it did not pay to use a crusher at the Rome (Ga.) works, because in the summer season the people would not burn coke

or coal on account of climatic reasons; but in the winter time the daily production, as well as the summer supply, could be readily disposed of in the lump state at the price of 10 cents per bushel.

[To be continued.]

The Gas Question at St. Louis, Mo.

AS NOTED BY AN ONLOOKER.

It is now over three years when certain Philadelphia "water gas people" were attracted to the city of St. Louis, Mo., no doubt "drawn" thereto by the apparently fruitful field then afforded to raiders of their sort. These gentlemen were aided by a few local capitalists, amongst whom may be included a firm who have made the bulk of their fortune through selling gas mains and building gas works, and shipping gas works appliances throughout all the western country. The Philadelphians and their very few local allies organized a corporation, and in order to obtain a charter immediately stooped to deception; protesting that they wanted to make gas to be used for heating purposes *only*. And so the St. Louis Gas Fuel and Power Company was duly established, and commenced to erect works, lay mains, advertise for customers, etc. The gas was to be made under what is generally understood to be the "Lowe process." No sooner had the charter been obtained, mains laid, and gas made, than the new corporation threw off the mask of a "Fuel Gas Company" only, and distributed gas for lighting—in fact they sent out a regular illuminating water gas. The city had been supplied previous to the advent of the new-comers by three gas companies—*i. e.*, the Carondelet Gas Company, a suburban concern, which does not figure in the present contest; the St. Louis Gas Light Company, then supplying the southern portion of the city, and about the oldest company on the ground; the remaining corporation being the Laclede Gas Light Company, which supplied the northern portion of the city—and the territory of the same, by reason of the rapid growth of its district, was greatly increasing in size and importance with each succeeding year.

Naturally the older companies had watched with great interest the operations of the new "Fuel Gas Concern." They had not attempted to check its organization; for, up to the very last minute, one of the members of the local iron works' firm before referred to had given the most positive assurances to his old patrons—and these embraced the three older St. Louis Companies—that only gas for heating and power purposes would be made. As soon as the deceit was discovered the St. Louis Gas Light Company commenced an action in State Courts against the "Gas Fuel and Power Company." After some time had elapsed it was at last decided, and in the highest legal tribunal of the State of Missouri, that while the new concern *did* have the right to make any kind of gas it pleased on its premises, and could sell the same to whom it pleased, it could not use the public streets of the city for the purpose of laying gas mains or service pipes, because the right to do these things was vested in the old company for a term of years, according to a contract made with the city. This decision settled the raiders, at least for a while. The Laclede Gas Light Company did not go to the courts at all; but promptly met the cut in price made by the new concern, and took effective steps to improve its works, and cheapen the cost of gas making. The parent company was not idle in that direction either, as two 2,000,000-feet Standard washer scrubbers, a new station meter, and new purifying apparatus and house (all recent additions), testify. The Fuel and Power Company had laid about eight miles of mains, when the previously mentioned decision of the Supreme Court put a stop to that work. As stated, the Laclede Company asked no help from the courts; but by reducing the price, and bettering the quality of the gas—all of which was made possible by means of new and improved apparatus, and some little change in the management too—met its piratical opponent squarely on that basis. The new company at first secured quite a number of consumers, but appeared also to lose them with great celerity.

Thus matters stood, in May last, when the Western Gas Association met at St. Louis. The Philadelphians (those particular ones meant herein), however, are noted for their vast (I had almost said infinite) "cheek." The plant they had erected at St. Louis consisted of one small gasholder of about 5,000 cubic feet capacity, with a second one of about 140,000 cubic feet capacity; two sets of purifiers, one 8′×10′, the other being 20′×20′—the latter a good set and housed in a good building; one 10′ station meter; a small brick office; and, lastly, a frame shed, in which the boiler, engine, one fan blower, and a couple of "Improved Lowe Generators" were situated. The generating plant was of the latest Lowe style, with boiler attachments, so often boastfully advertised. It may here be remarked that the boiler attachment would not work at all, and was thrown into the yard (where it now lies), which necessitated the erection of an independent boiler as a substitute. The inside of the generator house is apparently built of charcoal; which, with the "Gas Maker"—with one ear burned off, and one hand badly scarred, is not likely to reassure the feelings of any chance visitor who may gain access to the generally nailed and locked-up works of the "Gas Fuel and Power Company, of St. Louis." A worse looking concern for a gas works than the one described—as a whole—really is, would be hard to imagine. The "company" rents an office in the Lindell Hotel, one of the best in the city; and which hotel is supplied, by-the-way, with coal gas made at the Laclede works. They used water gas, but gave it up. During the past autumn the managers of the water gas concern sought to put new life into the corpse by offering to prominent St. Louis citizens a *controlling interest* in their company. The works described were capitalized at one million dollars in *stock*, and one million dollars bonds. The generous Philadelphians offered the St. Louis gentlemen a little over $500,000 worth of stock for the sum of one hundred thousand dollars. They proposed to keep the rest—and the bonds too. Now, remember, the whole plant is certainly not worth $100,000. Were they not generous? They did interest some people; but, so far as known, the stock was to be bought on condition that the City Council should pass an ordinance giving the water gas company the privilege of laying mains. The old St. Louis Company, with rare stupidity, kept up the price of gas at a figure ($2.50 per 1,000) which everybody had a right to consider too high, since the Laclede Gas Light Company was selling at $1.50 per 1,000, claiming to be satisfied with that, and only desired to be let alone—even promising, unless coals and labor got dearer, to rather reduce than increase the price of gas. Bills were introduced in the City Councils giving the water gas Company the right to lay mains. These were met by other bills extending the formation of the old St. Louis Company beyond its charter, under condition that the price of gas should be reduced in its district. The "ordinances" were quite numerous. Finally one was hatched out by some of the city officials, by which, if passed, the price of gas in the old company's district would be reduced from $2.50 to $1.75 per 1,000 cubic feet, and the franchise of that company extended 20 years. At the same time the Laclede Company was to increase the price of gas to its consumers from $1.50 to $1.75 per 1,000, and pay the increase of 25 cents per 1,000 sold into the city treasury. Then there was a grand howl of indignation. The Laclede Company's consumers could not see why they should be taxed 25 cents per 1,000 feet of gas used, in order that the old company should do simple justice to its consumers. And the consumers of the old company, while benefited by the reduction, would not be quieted; and the people and newspapers talked, wrote and printed, nothing but gas, gas, gas, and all united in shouting, "Down with the old monopoly!" Nor did the Laclede Company escape condemnation. Its apparent acquiescence in the measure brought down the vials of wrath upon this otherwise popular corporation. The water gas company withdrew its first proposition, taking advantage of the popular feeling, as might be expected, and presented another bill, offering gas at $1.30 per 1,000 cubic feet if granted the desired franchise. Now, it should be understood that, because of reasons not necessarily stated here, but yet solid facts, water gas cannot be made and sold at St. Louis as cheaply as good coal gas. It is exceedingly strange that the old St. Louis Gas Company did not profit by all the signs of the times. There would seem to be no example in previous gas history like unto the blindness they have so far exhibited, and rarely will we find it paralleled in civil history; certainly, it would seem to me, not until we go back to the antics of the French Bourbons just prior to the great revolution of a century ago.

When the various gas bills were brought up for action in the local "House of Delegates," it was freely charged that the members had been bribed by either the old coal or the new water gas company. It was charged by a member, in open session, that the attempt had been made. An investigation was ordered, and really commenced. Enough was shown that the water gas company had been very free with their offers of stock at very low figures to members of the city councils; but no case was made out, and the committee of the House of Delegates having the investigation in charge abandoned the matter by mutual agreement, just at a juncture when everybody thought something would come of it. The water gas bill was not acted on; but the old company's bill was passed by the "Delegates," and then in the "Upper House" of the Council the bill was laid on the table. As the election for a whole new set of city officials was now at hand, it was finally agreed upon in both houses of the City Councils to take no further action in the gas matter, but to leave the whole question to be settled by their successors in office. All the candidates for office, from the Mayor down, were interviewed as to their standing in relation to the gas question, and their replies to the questions were published. The election is now over, and the whole gas matter will undoubtedly be reopened at an early date.

The foregoing is about as succinct a statement, embracing the whole matter, as could be given. The majority of the people of St. Louis are not at all in favor of the water gas Company; on the contrary, the streets in many portions of the city having been newly paved with expensive material, the people are rather in favor of the older companies. But the persistency and the blindness with which the old St. Louis Gas Company clings to its $2.50 per thousand schedule maddens the people and makes them almost willing to do anything—even to the point of committing the folly of granting the water

gas company anything it asks for. The universal experience of gas companies, that, by a material reduction in the price of gas, the increase of sales more than compensated the otherwise decreased profits, so that the dividends would not be affected, these people cannot be made to understand or believe. And so they go on fooling and fussing with lawyers, politicians, and kindred spirits, and worrying themselves without cause, when by a reasonable reduction in price they would have more money in the end, and have the people as their friends to.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, April 10, 1885.

A report on "Standards of Light" has been prepared by Mr. W. J. Dibdin, F.I.C., F.C.S., chemist and superintending examiner to the Metropolitan Board of Works, in accordance with instructions received from that body some months since. It comprises an elaborate series of experiments made with the standard sperm candle, the Keates oil lamp, Vernon Harcourt's pentane standard, Methven's slit, and Sugg's 10-candle slit. As the result of his experiments, Mr. Dibdin is of opinion that the public "are now in possession of four reliable substitutes for the candle as a standard of light;" but in the main principle it comes down to two—viz., the substitution of oil, as in the Keates lamp, or of air gas, as in the apparatus proposed by Harcourt, Methven, and Sugg respectively. There is, however, a marked difference between Harcourt's plan of taking a flame burning from a round hole, and that followed by Methven and Sugg, which consists in using an ordinary Argand burner, and intercepting a portion of the flame by means of a screen. In the selection of one of these four as the standard, however, there seems some likelihood of *embarrasse du richesse*. Mr. Dibdin evidently prefers the Keates oil lamp; he does not, however, recommend that this should be adopted to the exclusion of the other proposed standards, but suggests before any one of these substitutes for candles is accepted as the standard of light that a systematic series of tests be made with them, by means of a four-way photometer, for the purpose of determining, under conditions beyond all question, which in practical working gives the most uniform results and the closest approximation to the legal standard at present in use in this country. Such a test would certainly afford useful information; and to avoid possible dispute each standard might be manipulated by its particular champion. Mr. Dibdin, for example, might operate with the Keates lamp; Messrs. Hartley and Hirsch with the Methven slit; Professor Vernon Harcourt might with the pentane test; and Mr. Sugg might follow with his 10-candle slit. I do not know who would take the sperm candle, for these authorities, however much they may differ as on other points, all agree in condemning the candle, and being anxious to give it a parting kick. Such an experiment might perhaps settle the question of a light standard to the satisfaction of the Metropolitan Board of Works; but really there are so many different standards in the field that anything like an international agreement on the subject (which has recently been suggested) seems perfectly hopeless. This appeared to be the position of affairs when the subject was considered in Paris a few years ago. Even if the claims of these four standards, proposed in connection with coal gas, could be satisfactorily adjusted, there are many others that have been suggested from time to time. Besides various combustibles there have been units of melted platinum and silver, and various arrangements of incandescent electric lamps, and many other arrangements, brought forward as improvements on the sperm candle. Even in regard to a standard for determining the lighting value of coal gas —which is a considerable narrowing down from the general question of a unit of light suitable for any kind of scientific illumination, and analogous to the units applied to heat and electricity—it seems likely to remain a case of "doctors differing." A committee appointed by the Board of Trade lately reported in favor of the pentane standard, and a committee appointed by the Gas Institute expressed a preference for the Methven slit; and now we find Mr. Dibdin taking up a central position, but with a little inclination toward the Keates lamp. So the matter stands, and is likely to remain until the general state of knowledge respecting the mechanical and chemical properties of light has advanced substantially beyond its present stage; and until a greater degree of unanimity prevails as to the substitute for the candle, it seems possible that this much abused standard will maintain its position as the legal unit of light.

Mr. Thomas Fletcher, of Warrington—who delivers so many lectures that one wonders when he finds time to invent gas appliances, and invents so many gas appliances for heating, cooking, and special technical purposes that we may well speculate how he possibly finds time to prepare his lectures—has recently given a lecture on "Smokeless Houses and Manufactories," under the auspices of the Smoke Abatement Institution. He said that his principal business that night was to give actual results obtained in his own works and house, which were and had been for a long time practically smokeless. Mr. Fletcher has entirely banished coal from his house, and gas supplies all requirements for fireplaces, water heating, bath heating, washing, drying, ironing, cooking, and general domestic purposes. This has been accomplished with no alterations other than those inherent to the laying on of ample sized gas supply pipes. The first cost of the whole of the appliances he estimates at £26, and his gas bill for twelve months, with gas at 3s. 3d. per thousand cubic feet, has been about £22; showing a consumption of 130 to 140 thousand cubic feet of gas. "The work has been done in a style impossible with coal, at about the same cost, and with a great saving in dirt, servants, and inconvenience." With the gas appliances he has been able to have fires in the bedrooms each morning and evening, if necessary, to say nothing of many other advantages.

Well done, Mr. Fletcher! Let us hope you will long live to enjoy the comforts of gas appliances in your own home. And, by means of lectures and improved appliances, to call general attention to the advantages of gas both for domestic and technical purposes. Facts such as the above are more likely to aid the objects of the Smoke Abatement Institution than the proposed tax on fireplaces, the enforced use of anthracite coal, and other methods that have at times engaged the attention of its zealous but sometimes rather impractical supporters.

The Glasgow Gas Corporation recently appointed a special sub-committee to "consider and report on the whole question of the utilization of gas for other than illuminating purposes, more especially as applied to domestic heating and cooking, and to make such recommendations as they might think suitable to be adopted in Glasgow, with a view of promoting the more general use of gas for domestic and trade purposes." The committee have gone to work energetically, personally visiting many of the principal towns in England and Scotland, besides sending out letters of inquiry; and with the aid of the information so acquired, they have presented a report which attains almost to the proportion of a treatise on the present position of the subject. It is needless to add that the whole of the evidence collected is favorable to the system of letting stoves on hire. The report, of course, includes much with which gas engineers are already acquainted through the medium of their serial literature; but it may be commended as a useful work for the use of directors of gas undertakings, or members of gas committees, as it sets forth the advantages of promoting a day consumption of gas, both to the venders and consumers. Remembering that so many gas companies and corporations have had the hiring system in successful operation for so many years, it seems rather late in the day for such an important town as Glasgow to be collecting information on the subject. I notice that several other Scottish towns are turning their attention to the subject of offering every facility for increased summer and day consumption.

An action recently tried at the Hereford County Court illustrates a disadvantage that has frequently been brought forward as an objection inherent to the discount system, but which really arises in practice. If an allowance is made for prompt payment, it stands to reason that it must be confined by a hard and fast line, within a limited time; or otherwise it will soon become a dead letter. The usual practice in this county is—discount allowed if paid within a month after the quarter day. The Hereford Corporation, as owners of the gas works, sued a consumer for a small sum, being the amount allowable as discount on a quarter's consumption, which amount they alleged that the defendant had forfeited by not paying his account within the stipulated time. The defendant alleged that he had always paid the gas accounts promptly, but with regard to the one in question, it was not delivered until within a day or two of the expiration of the discount period; and that he had paid it, less the discount, within nine days of the delivery. In point of law the Corporation was correct, and of course they obtained a verdict. Whether it is advisable in these matters to rigidly abide by a hard and fast rule is an open question. The assertion that the account was not delivered until a day or two before the latest date for discount was not disputed, and the usual practice appears to have been the allowance of a few weeks between the delivery of the bill and the expiration of the discount period; so the defendant is certainly entitled to some share of sympathy. Where a consumer is known to habitually attempt the evasion of the discount rule, harsh measures may perhaps be advisable; but the case assumes a different complexion when the default is committed by accident, on the part of an habitually punctual payer, and especially when the oversight is abetted by an irregularity in the delivery of an account. Under such circumstances an exception can be made without fear of establishing a precedent, and probably the Hereford Corporation will eventually find that their best policy would have been to have let the matter drop, and taken care to present their accounts promptly in future. I take it that the prompt rendering of accounts is the backbone of any discount system.

The verdict in the case of Sugg *vs.* Bray, mentioned in my letter that appeared in September last, has just been declared. After taking eight months to consider his judgment, Mr. Justice North has announced as his decision that the action is to be dismissed without costs, and promised to give his full judgment later on. So it cannot be said that the matter has been un-

duly hurried. Indeed the legal proceedings first commenced nearly four years since, and it is said that the entire cost on both sides approaches to £20,000. It will be interesting to read the reasons which have led the learned judge to this decision, for, in a case of this sort, a judgment of "dismissed without costs" is not without some similarity to the celebrated verdict of the Welsh jury—"not guilty; but don't do it again."

Now that the cost of incandescent electric lighting is calmly and judicially investigated, there is overwhelming evidence that this system can never compete successfully in a pecuniary sense with gas; and the utter fallacy of the extravagant assertions that were advanced, and in many quarters accepted as fact, is now fully established. A paper recently communicated to the Physical Society, by Professors Ayrton and Perry, embodies some interesting information as to the best and most profitable methods of working incandescent lamps, the results of practical experiments at the Finebury Technical College, with Edison 16-candle lamps. The best result obtained by these well-known and acknowledged experts was 11d. per candle power for a period of 560 hours, and the cost of maintaining a 16-candle light for that period would be 14s. 8d. The quantity of coal gas required to maintain a light of similar power would be 5.0 cubic feet per hour, and this could be greatly reduced by using modern improved burners. But taking it at 5 cubic feet, the total quantity of gas required would be 2,800 cubic feet. So the above result is equivalent to something more than 5 per cent. per 1,000 cubic feet for gas, or an approach to double the price at which it is actually sold. If experts, working under the most favorable conditions, fail to realize a marked economy as compared with coal gas, it seems out of the question to attempt to realize such in practical working. It usually happens, too, that the estimates of these scientific gentlemen are deficient in the matter of repairs, establishment charges, etc.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

A Chapter from Morristown (N. J.) Gas Records.—Morristown, N. J., takes high rank amongst the numerous beautiful townships that are located within short distance of or right close to the steel ways of the D. L. & W. Railroad. The quiet waters of the Whippany river ripple over its course pretty much as they did during the war of the Revolution, over 100 years ago, or when Morristown gave shelter to the sorely-tried patriots of '76. The township has hardly been true to its promise of some 25 years back, when it bid fair to become a manufacturing center of considerable importance; but it would seem as though New Brunswick had attracted the tide of trade that was to come. Even though Morristown's growth has been retarded, it is still a bustling township, and signs of business progress have again manifested themselves. To show that the quickening hum will be fostered by the old Morristown Gas Light Company is the purport of this item, and the following details will convey how the corporation's managers propose to do it. The company celebrated its thirtieth birthday on the 19th of last February, and we are sorry to be obliged to chronicle the fact that shortly thereafter Mr. H. B. Stone resigned the Superintendency, being impelled to such a step on account of failing health. For years Mr. Stone has been the active agent in the direction of the company's business affairs, and probably in strict justice to himself he should have retired from the company's service at an earlier period than the one above noted. He has been a patient sufferer, and it is to be hoped that rest and quiet will bring him health and strength. With the beginning of '85 Dr. E. B. Woodruff, President of the corporation, considered that the time had come when the plant should be improved and enlarged, and to do so intelligently the amiable Doctor called to his aid the counsels of two engineers thoroughly competent to give him a fair and square opinion on the subject, with the result that, when the betterments are finally completed, the Morristown Company will have a first-class coal gas plant. Mr. Stone's resignation necessitated the engaging of a Superintendent, and Mr. H. M. Hunt, formerly in charge of the Hempstead (L. I.) Gas Works, was chosen as Mr. Stone's successor, Mr. H. taking control of Morristown works on April first. On same date the directors authorized the new superintendent to make the announcement to consumers that from and after date of April 1st the selling price of gas would be reduced to $2.50 per 1,000 cubic feet. The former price was $3. This is what we expected, and have no doubt, when the alterations and extensions spoken of above are carried out, that we shall hear of a still further step in the right direction.

Spontaneous Combustion Destroys a Pile of Gas Coal.—At the old station of the Boston (Mass.) Gas Light Company's works a bad case of spontaneous coal combustion was developed about three weeks ago. The company had about 20,000 tons of coal stored under one shed, and when the discovery of its heated condition was made the combustion had made such progress that it took a long while to master it. One estimate given places the quantity of coal destroyed at about 5,000 tons. The loss is quite a serious one.

An Acknowledgment.—We desire herewith to acknowledge an invitation received by us from J. W. Allison, President of the "Cotton Seed Crusher's Association," to attend the annual convention of that organization, held at New Orleans, La., on Tuesday, April 21st. While we could not make the trip, we are obliged for the courtesy extended, and hope that Bro. Jackson and his associates had a successful re-union. Mr. Allison is also President of the Jackson (Tenn.) Gas Light Company.

It Must be a Joke.—A despatch to the daily papers, dated Philadelphia (Pa.), April 11th, says: "In consequence of frequent complaints of consumers that their gas bills are enormously high, the trustees have ordered an investigation into the competency of the firm who secured the contract to make the meters to ascertain whether or not the workmen are skilled mechanics." Now, we do not submit the above "despatch" (it is taken from the columns of the New York *Tribune*) either as a model of composition or as a specimen of terse diction; but we would ask if the *Tribune's* correspondent at Philadelphia is inclined to be "funny?" The Goodwin Company has supplied in past times large "lots" of meters to the Trust, and if the company's men did "strike," and did join the "Knights of Labor," we never heard aught said against them as skilled mechanics in their particular line of work; so the reported resolution (as claimed above) passed by the Trust can have no reference to the Goodwin folks. On the other hand, the successful bidders of this year (Messrs. Helme & McIlhenny) justly enjoy as good reputation as any other firm of meter makers in this country are possessed of—we have known them both for years, and the older the acquaintanceship grows the firmer does it become—and so the resolution can have no reference to them. Take it all in all, it must be a joke; and could probably have its origin traced back to the "brilliant brain and fertile pen" of ome one of the numerous "comic journalists" located in and about the Quaker city.

Hannibal (Mo.) Gas Light Company Reduces Selling Rates.—In our last issue mention was made of the annual meeting of the American Water Works Association, news of which event had been forwarded us by the Secretary, who is also none other than the Superintendent of the Hannibal Gas Light Company. Mr. Decker, even though he has always been prominently identified with the above-named Association, has not in any sense overlooked or forgotten the niceties of gas management, and he is just as active and spry in these departments as ever. He has succeeded in imbuing the minds of the Hannibal directors with the idea that cheap gas is a good thing, and since he assumed charge of the works four reductions in price have been made to consumers—the last of the four bearing date of April 5, 1885, when the managers empowered Supt. Decker to proclaim the fact that all consumption registered from first day of April would be subject to a gross charge of $2.50 per thousand, with a scale of discounts graded as follows: On monthly bills of less than $25, 5 per cent. off; monthly accounts between $25 and $100, 10 per cent. off; a 15 per cent. reduction to be granted on a monthly consumption exceeding $100 in value. The discounts only to apply when settlements are made on or before sixth day of month in which bill is presented. Mr. Decker is determined to secure a goodly day consumption with the coming summer, and to that end is making an intelligent canvass among the inhabitants of his city. Gas stoves are to be supplied, and the necessary fittings therefor put in, at net cost. He also offers to replace defective or worn out burners *without charge* for materials or substitution. This latter is a plan that should be followed by every medium sized company in the country; and the same practice would not do the "big ones" a bit of harm. The "official" notification of reduction concludes with the following plain statement: "We would remind you that your liberal consumption will make *cheap gas*, and this company stands ready to make the price of gas as low as the amount of sales will warrant." That is the way to talk, Brother Decker.

Killed by the Electric Current.—At Chicago, Ills., on evening of April 22, Charles B. Shultz, an electrician, stood on the top round of a ladder, at a height of 14 feet from the sidewalk, adjusting the carbon points in a dimly burning electric lamp located at corner of Clark and Madison streets. Losing his balance, he grasped both rods supporting the lamp, and through which the current was passing. He could not loosen his hold, but hung writhing and swaying with the swinging motion of the lamp until the engine actuating the dynamos was cut off. With the stoppage of the current the unfortunate man fell to the sidewalk a corpse.

Toronto (Ont.) to have Cheaper Gas.—Despite the fact that the Dominion of Canada has been more or less (generally "more") perturbed over the operations of the Half-Breed Riel, the "Canuck" gas men do not appear as very greatly scared, since they are paying attention to their business, and are "doing the square thing by their consumers." On April 22 Mr. W. H. Pearson, Secretary to the Consumers Company of Toronto, forwarded us the

information that the directors, at a meeting held April 20, gave him authority to inform the patrons of the corporation that all gas used for illuminating purposes from April 1st would be reduced in accordance with the annexed schedule—the discounts only to apply in cases of prompt payment: Ordinary consumers, $1.50 net—previous rate being $1.60; consumers burning an annual quantity reaching or exceeding 200,000 cubic feet to be furnished their supply at $1.30—previous rate $1.35. The reduced rate at which gas for cooking, heating, and power purposes ($1.25) was supplied has not been changed. The Consumers Company makes no rental charge on meters. Mr. Pearson's letter to us also conveys the pleasing intelligence that during the past six months his company's consumption has increased at a greater ratio than ever before, and this gain has been made in face of the efforts of the electric lighting promoters. Quite a number of the customers of the Consumers' Company who, for a period, used electricity exclusively, have come back to gas; Mr. Pearson also finding that the "missing sheep," once they did return to the true fold, now burn more gas than before their temporary alienation. "Let them alone, and they'll all come home," etc. Mr. Pearson always was a consistent advocate of cheap gas.

Trying to Fix Gas Prices at San Francisco, Cal.—The San Francisco (Cal.) Board of Supervisors lives in the gas man's memory as the "municipal body" that let San Francisco's streets remain in darkness (rather than pay the people who did the lighting) some two or three years ago. We have never been informed as to whether the San Francisco Gas Light Company got the back moneys due it for street lighting at that period; and right here we might complain a trifle about the dereliction of our Pacific Coast friends in "posting" us on what is going on in gas circles out "in the land of the setting sun." At any rate, the lighting committee of this progressive body of public representatives, during a session held on April 8th, were engaged in an attempt to fix the price to be charged for gas at an all round figure of $1.75 per 1,000; and this they sought to do under what is known as the "Coffey Act." Strange that legislators bearing the name of "Coffey" should be so anxious about "fixing" gas prices. There is our own "Coffey," up at Albany, who thinks he has given sufficient grounds for settling the price at which gas should be sold in the larger cities in the Empire State; still there is the probable danger (to him) that the strain upon him will be so great as to upset his pot; but, of course, that remains to be yet made clear. We are not cognizant as to the peculiar provisions of the California "Coffey Act;" but President J. D. Crockett's reasons for opposing the "fixing" of gas prices in San Francisco, at the scale proposed, were given as follows: The average price of caking coal there is $6.96 per ton, and shale for enriching comes at $11; stokers are paid $3, and helpers are paid $2.25, per day; and so it goes all through the list. To sum the thing up, the prices entering into cost of manufacture are, as whole, 35 per cent. higher than in the East. We believe the committee finally agreed to report back to Board on a $2 basis. Would Mr. Crockett kindly let us know what determination was reached?

Extending Mains at Long Branch, N. J.—The new management of the Long Branch Gas Light Company are making extensive additions to plant capacity. About the most important item in connection therewith is the lengthening of the conduit system, the contract for same having been awarded to Mr. T. E. Crimmins, of New York city. We understand that Mr. Crimmins' contract calls for the placing of about six miles of eight-inch pipe, and the work was to have been started in on Tuesday, April 28th.

Huntsville (Ala.) Gas Company at the Same Work.—The Huntsville Gas Light Company, Mr. J. W. Murdock, Supt., is putting underground 5,000 feet of eight-inch main. The capital stock of this company is only $36,000.

Its Epitaph Written.—The Tucson (Arizona Ter.) Electric Light Company has closed down indefinitely, and for the very good reason that every 24 hours continuance of business but added to its financial difficulties. The managers are apt to vouch for the truth of the statement that electricity is but "the light of the future."

Trying to Induce the Poughkeepsie Common Council to Try Electric Street Lighting.—"The American Electric Illuminating Company" is apparently very anxious to "illuminate" the streets of Poughkeepsie, N. Y., with its carbon points. As a starter the managers made a proposition to Common Council that they be authorized to put up 25 lights at such points as the authorities might designate, the price for each to be placed at $182.50 per annum. The Citizens Gas Company is now doing the lighting, and for the ensuing year proposes to bid for a continuance of the work at the rate of $31 per post—or a total sum (there being 621 lamps) of $19,251. Last year the Citizens Company paid into the city treasury, as taxes, the sum of $3,750, while the electric company with the "big name" is only on paper yet; still its promoters come smilingly forward with their proposition. To show the saving that might be expected in case of a change from gas to electricity, Alderman Owen, during the informal discussion on the question, said that the lighting of avenue leading from the Post Office to Eighmie Place by arc lamps would annually cost $1,297.50; whereas the expense for gas was but $341. Ald. Corcoran said the people were well satisfied with the present system, and the only parties desiring the change were those interested in the electric company. No positive action, up to last advices, was taken on the proposition.

Another Reduction in Gas Rates at North Adams, Mass.—At the annual meeting of the North Adams Gas Light Company (April 6th) W. L. Brown was chosen President; F. S. Richardson Treasurer; and A. D. Cady Secretary. The results of reduction made about a year ago were so gratifying to the directors that Mr. Richardson had no trouble in persuading the management about the good policy of "going still lower." The price to ordinary consumers was reduced from $2.50 to $2.25 per 1,000; consumers of over 20,000 cubic feet per month to get their supply at $2.15. The lower rate will also be made to apply to all consumption of gas for other purposes than lighting. The mill proprietors of North Adams (there are a number of them in that city) get a further concession of 20 cents ($1.95) per thousand. Despite the efforts of a local electric lighting company, the business outlook of the North Adams gas man is decidedly promising. Brother Richardson evidently means that it shall continue so.

Milwaukee (Wis.) Heard from.—The price of gas at Milwaukee is to be lowered from and after July 1st, 1885. Particulars will be given in next issue.

The Death Roll; Case No. 1.—A man named Geo. Harris, a temporary sojourner at the Pacific House, Quincy, Ills., "blew out the gas" before retiring, on night of Sunday, April 5th. Next day he was found in an unconscious condition. He was removed to the Blessing Hospital, where he remained in a state of insensibility which ended in death on night of 8th. Wm. Ketha and wife were overcome by gas, on night of April 9th, in their apartment in Quincy House, Ills. Early following morning the couple were found unconscious, and gas was escaping into the room from a turned-on burner. Dr. Byrd succeeded in reviving them. They owe their escape to the fact that a window to the apartment was but partially closed.

Case No. 2.—Mary Harrington, a domestic in the employ of Mr. Geo. S. Curtis, residing at No. 167 W. 130th street, this city, went to her sleeping room on night of April 15th last, and before going to bed "blew out the gas." The tracing of an escape of gas to her room developed the fact that she had been asphyxiated during the night. The body was removed to the Morgue.

Case No. 3.—Wm. Ahearn, an inmate of the Putnam House (located at 369 Fourth avenue this city), and registered as coming from Woodbridge, N. J., "blew out the gas" on night of 23d April. Next morning he was removed to Bellevue Hospital, where his demise ensued on Friday, 24th.

Case No. 4 is a Surprise.—At last we have a death from coal gas inhalation. The case reported is that of H. W. Ash, of Steuben, Me., who, while on a visit to Rockland, in same State, put up at the Thorndike House, on date of April 3d. Ash had been indulging in alcoholic stimulants, and according to the testimony developed at the inquest it was concluded deceased had, after retiring to bed, been obliged to relieve his stomach—the state of wash basin showed this, as also did the bed linen—and that in shutting the burner key off he inadvertently turned the gas supply on again, his dazed condition preventing timely discovery of the fact. Coal gas is made at Rockland.

She Recovered.—Mr. Marcus Smith, Secretary Wilkes-Barre (Pa.) Gas Company, writes us to say that the "special" to New York papers (published as "Case No. 2," in April 16th issue) was in error in so far as it reported the death of the domestic, Kate Schlessinger. Mr. Smith says that all of the sufferers in the Wilkes-Barre prostration of April 5th "speedily recovered. We are glad of it.

What Electric Street Lighting May Cost New York City.—An estimate of the cost of lighting the city by gas and electric light was submitted to Aldermen on April 24th, by Mr. S. McCormick, Supt. of Lamps and Gas. It appears the 647 arc lights now in use cost $165,308 per annum, and the gas lamps so displaced would cost but $52,780. Council resolutions call for 2,093 additional arcs, the total cost of which would be $537,761; these would displace gas lamps that could be maintained at an annual expenditure of $93,537. Should the arcs ordered be put up their total cost to city would be $700,700. The city's gas bill would yet reach $350,616, making a grand total of close on to $1,100,000. Mr. McCormick reports that the only advantage he can discover in the arc system over gas is that of instantaneous lighting. Corporation Counsel Lacombe has informed Commissioner Squire that the law of 1884 prohibits the stringing of any additional wires on poles now in use. If the electric companies be authorized to lay on additional lights they will have to bury the wires. [The Gas Commission awarded the contracts on April 28th. We will give them in next issue.]

The Market for Gas Securities.

As advised by us at time of last market report, Consolidated gas purchased at the then ruling rate proved a decidedly "good thing." Between dates of April 15th and 30th about 8,000 shares changed hands, opening price on April 15th being 83 bid; opening price (sales made too) on 30th, 90½. The Senate bill for creation of a Gas Commission for New York city was defeated in Assembly on afternoon of April 30. Noon quotations for Consolidated are 90 bid, offered at 91. Equitable gas is remarkably strong at 113 bid. Mutual is also higher, 126 bid.

Nassau gas, Brooklyn, has declared and paid a dividend of 2 per cent.; Fulton Municipal has paid one of 2½ per cent. Baltimore Con. is fairly steady at 54 to 55. Huntsville (Ala.) Gas Company earns and pays an eight per cent. return per annum. It is reported from good sources that the Fulton Municipal managers are contemplating a raid upon the Flatbush (L. I.) Gas Light Company. They propose, according to the rumor, to extend a main out along Flatbush avenue, and compel the Flatbush Company to supply its consumers with the most approved article of carbonic oxide.

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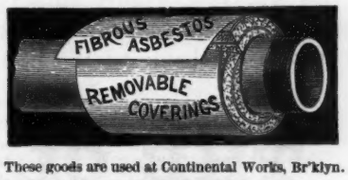

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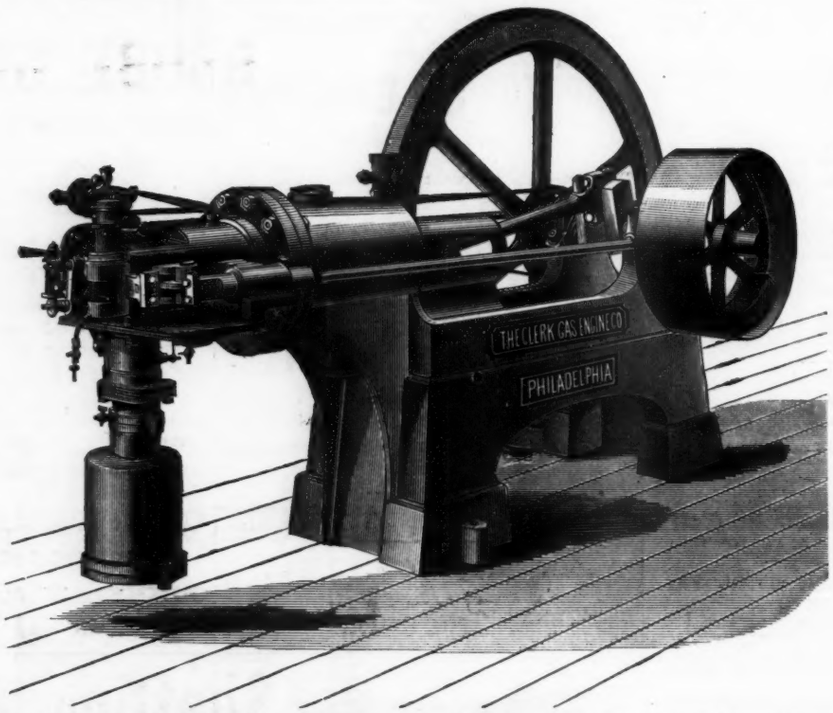

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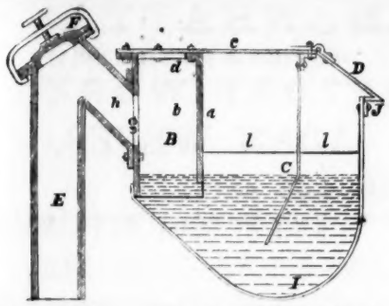

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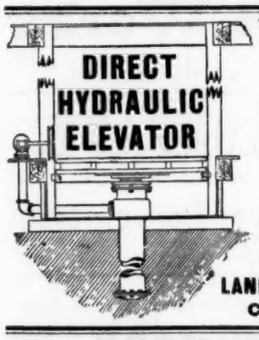

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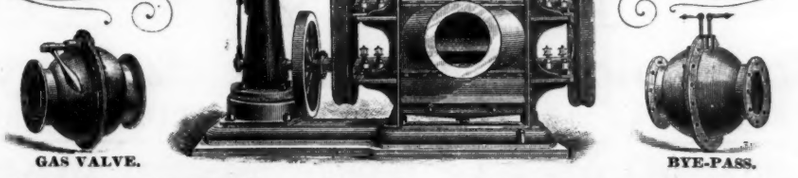

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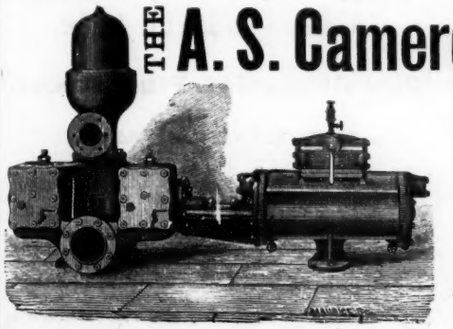

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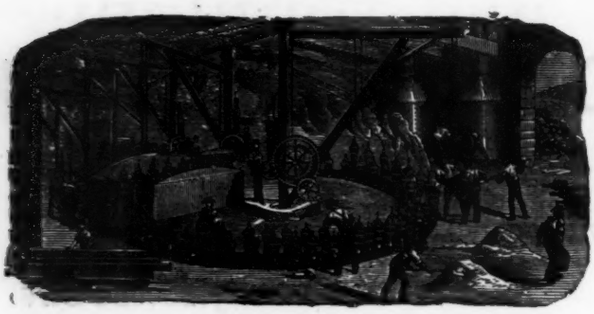

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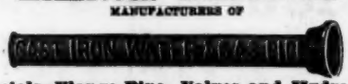

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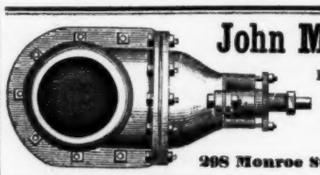

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Man'facturer of

GAS VALVES.

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The Journal

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Price, $1.25. Sent either by express or mail, as directed. By mail the postage will be 20 cents, which will be added to the price of the Binder.

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Siemens's Regenerative Gas Burners,

For Lighting and Ventilating.

THE CHEAPEST, PUREST, AND MOST BRILLIANT OF ALL GAS LIGHTS.

Superior to the Electric Light in Economy, Beauty, & Steadiness.

SPECIALLY ADAPTED FOR LIGHTING HALLS, FACTORIES, OPEN SPACES, ETC.

Numerous Tests made by various Gas Companies in the United States show an Efficiency of Ten Candle Power per Cubic Foot of Gas.

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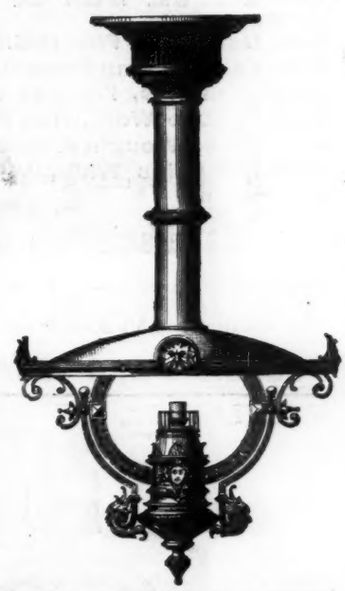

THE SIEMENS REGENERATIVE GAS LAMP COMPANY,

SOLE MAKERS FOR THE UNITED STATES,

N. E. Cor. 21st. St. and Washington Av., Philadelphia, Pa.

THE "STANDARD" WASHER-SCRUBBER,

KIRKHAM, HULETT & CHANDLER'S PATENT.

Total Capacity per 24 Hours of "Standard" Washers Ordered During the Following Years.

1877	4,000,000 cubic feet.
1878	4,750,000 "
1879	24,545,000 "
1880	42,967,500 "
1881	36,462,500 "
1882	39,300,000 "
1883	57,735,000 "
1884	26,177,500 "
Total	235,937,500 cubic feet.

Total Number and Capacity per 24 Hours of "Standard" Washers Erected and in Course of Erection in the Several Countries

	Number.	Cubic Feet per Day.
Great Britain	151	157,070,000
Western Hemisphere	38	39,337,500
Australia	18	12,150,000
New Zealand	2	650,000
France	6	4,550,000
Belgium	8	5,420,000
Germany	16	8,200,000
Holland	4	4,160,000
Denmark	1	150,000
Russia	2	3,500,000
Spain	1	350,000
India	1	400,000
Total	248	235,937,500

THE CONTINUED POPULARITY

Of these Machines

Will be recognized from the following extracts from letters from representatives of some of the companies having them in use:

ALLEGHENY GAS WORKS,
ALLEGHENY, PA., Dec. 12, '84.

MR. GEO. SHEPARD PAGE, New York:

Dear Sir—The "Standard" Washer Scrubber is giving us entire satisfaction. At present we are using one gallon water per thousand cubic feet, and the liquor as it leaves the Scrubber is 8 degrees (16 oz.) by Twaddle's hydrometer.

Yours respectfully,

ROBERT YOUNG, Eng'r.

"Standard" Washers Ordered During the Current Year.

	Cu. Ft. per Day
Anneberg Gas Co	200,000
Bombay Gas Co	400,000
Brussels Co	1,250,000
Chemnitz Gas Co	1,000,000
CITIZENS GAS CO., BUFFALO	750,000
Coke Works in Zabre, Ober-Schlesien	1,500,000
Cokerei der Friedenshutte, Upper Silesia	500,000
Dumfries Corporation	250,000
Dunedin Gas Co., New Zealand	400,000
King's Lynn Gas Co	300,000
Leiden, Holland	600,000
Lincoln Gas Co	400,000
Liverpool Gas Co	2,000,000
" "	3,000,000
LOUISVILLE GAS CO.	1,500,000
Numea Gas Co	100,000
PITTSBURGH GAS CO.	1,500,000
PORTLAND GAS CO., Oregon	562,500
SAN FRANCISCO GAS CO	4,000,000
Sheepbridge	40,000
ST. LOUIS GAS CO.	2,000,000
Sydney Gas Co	2,500,000
WASHINGTON, D. C. GAS CO	2,000,000
Whitchurch Gas Co	175,000
Total	26,177,500

GEO. SHEPARD PAGE, No. 69 WALL STREET, NEW YORK,

SOLE AGENT FOR THE WESTERN HEMISPHERE.

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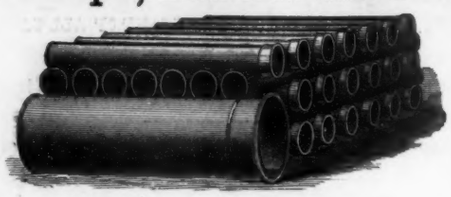
400 Chestnut Street, Phila., Pa.

Cast Iron Gas & Water Pipe, Water Machinery & Gas Apparatus

Cast Iron Pipe, Fire Hydrants, Eddy Valves, Lamp Posts, Large Loam Castings, Flanged Pipe, Sugar House Work, Iron Roofs and Floors, Wrought & Cast Iron Tanks, Turbine Water Wheels and Pumps.



Gasholders, Lime Trays, Center Valves, Purifiers, Bench Work, Exhausters, Condensers, Governors, Scrubbers, Gas Valves Station Meters, Cast Iron Pipe Fittings.

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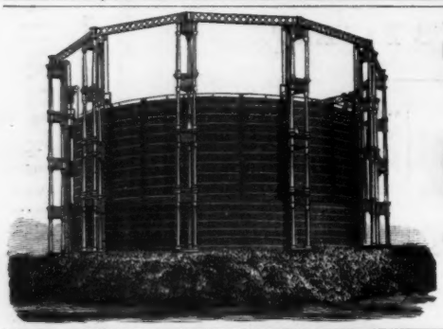

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Tanner & Delaney Engine Co.

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Gas Apparatus,

INCLUDING

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ALSO STEAM ENGINES AND BOILERS.

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Washers, Scrubbers, Condensers, Purifiers,

And all apparatus necessary for the construction of improved new gas works and in the extension of established works. Also manufacturers of

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Plans, specifications, and estimates furnished promptly on application.

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Builders of Gas Works,

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To Gas Companies.

We make to order **CAP BURNERS** to burn any amount under a stated pressure. Send for samples.

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WASHERS: MULTITUBLAR AND AIR CONDENSERS; CONDENSERS; SCRUBBERS wet and dry), and

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Plans, Specifications, and Estimates furnished.

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Single Lift and Telescopic

GASHOLDERS.

Built, 1884:

Altoona, Pa	Capacity,	160,000 cubic feet.
Pittsburgh, Pa	"	250,000 "
" "	"	230,000 "
Bellaire, Ohio	"	50,000 "
Youngstown, Ohio	"	60,000 "
Canton, "	"	60,000 "
Akron, "	"	80,000 "
Xenia, "	"	10,000 "
Adrian, Mich	"	65,000 "
Ypsilanti, Mich	"	25,000 "
Muskegon, "	"	70,000 "
South Bend, Ind	"	70,000 "
Anderson, "	"	20,000 "
Plainfield, "	"	10,000 "
Springfield, Illinois	"	100,000 "
Evanston, "	"	50,000 "
Freeport, "	"	35,000 "
Elgin, "	"	60,000 "
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Key West Fla	"	10,000 "

Plans and estimates furnished for the erection of new and the rebuilding of old works. Address

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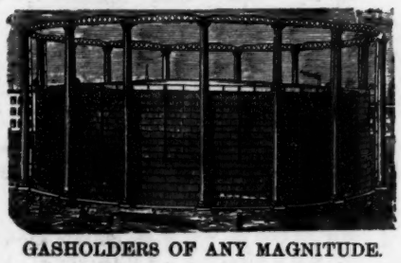

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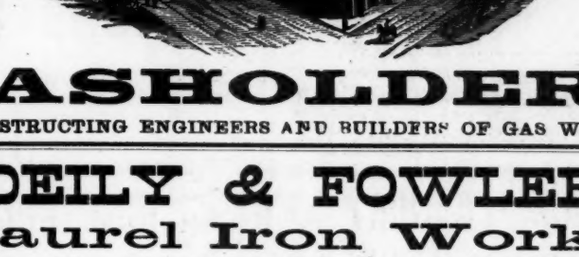

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OCEAN MINE YOUGHIOGHENY GAS COAL.

The Coal from the Ocean Mine (recently operated by Messrs. W. L. Scott & Co., of Erie, Pa.,) is now used by all the leading Gas Companies in the United States from Maine to Texas, and is recognized as *the only reliable Youghiogheny Gas Coal.* (See Map on p. 87 of this Journal, Feb. 16, 1885.)

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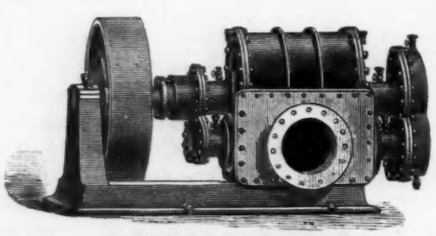

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Best, Cheapest and Most Durable Exhauster known.

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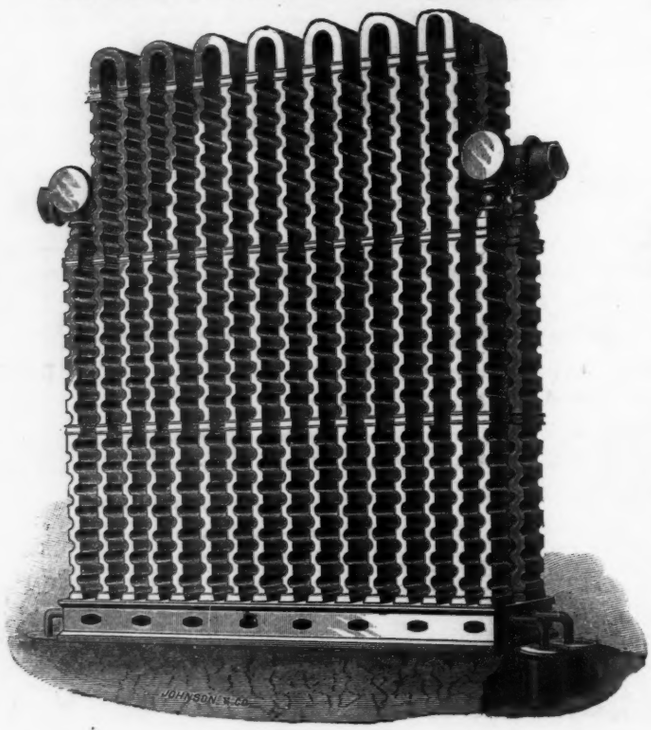

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GAS AND WATER MACHINERY

OF THE MOST APPROVED PATTERN.

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MINERS AND SHIPPERS OF

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ALSO SHIPPERS OF FOUNDRY COKE.

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Our capacity being now equal to 100 Engines per month, we shall hereafter keep in stock for immediate shipment all sizes from 4 to 200 H.P.

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The First Gold Medal awarded at the Crystal Palace Exhibition in London, and two Gold Medals at the Stockport (Eng.) Exhibition of Gas Appliances. Both in 1883.

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By C. J. R. HUMPHREYS. Price, $1.

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INTERNATIONAL--1876--EXHIBITION.

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12th and Brown Sts., Philadelphia, and 49 Dey St., N. Y., U. S, A.,

FOR THE FOLLOWING REASONS:

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Attest—J. L. CAMPBELL, Secretary, pro-tem. Signed—A. T. GOSHORN, Director General J. R. HAWLEY, President

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

Maryland Meter and Manufacturing Co.,

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Established 1866.

Nos. 22 and 24 Saratoga Street, Baltimore, Md.

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MANUFACTURERS OF

DRY GAS METERS, STATION METERS, GLAZED METERS, TEST METERS, METER PROVERS, PRESSURE AND VACUUM REGISTERS, GOVERNORS, INDICATORS, SERVICE AND METER COCKS, AND METER CONNECTIONS.

Dry Gas Meter.

With 30 years' experience and the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

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No. 153 Franklin Street, Boston. Mass.,

MANUFACTURER OF

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Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges, Pressure and Vacuum Gauges.

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Patent Cluster Lanterns for Street Illumination.

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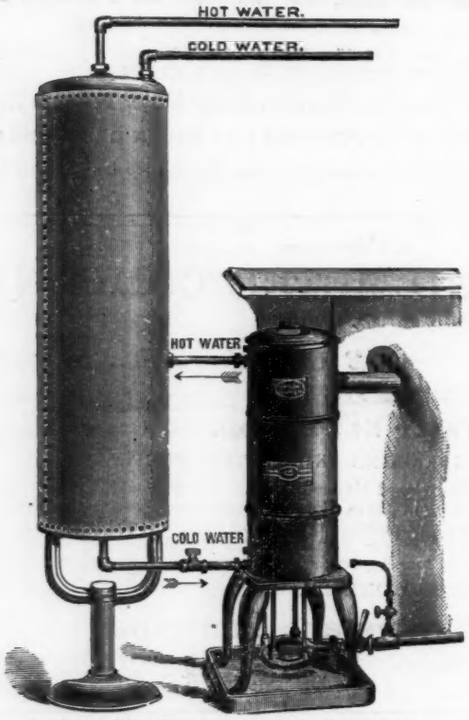

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